COUNCIL ON GRADUATE MEDICAL EDUCATION

Resource Paper

Evaluation of Specialty Physician Workforce Methodologies

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Health Resources and Services Administration

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The Council on Graduate Medical Education

The Council on Graduate Medical Education (COGME) was authorized by Congress in 1986 to provide an ongoing assessment of physician workforce trends, training issues and financing policies, and to recommend appropriate Federal and private sector efforts to address identified needs. The legislation calls for COGME to advise and make recommendations to: the Secretary of the Department of Health and Human Services (DHHS); the Senate Committee on Health, Education, Labor, and Pensions; and the House of Representatives Committee on Commerce. The Health Professions Education Partnerships Act of 1998 reauthorized the Council through September 30, 2002.

The legislation specifies 17 members for the Council. Appointed individuals are to include representatives of practicing primary care physicians, national and specialty physician organizations, international medical graduates, medical student and house staff associations, schools of medicine and osteopathy, public and private teaching hospitals, health insurers, business, and labor. Federal representation includes the Assistant Secretary for Health, DHHS; the Administrator of the Health Care Financing Administration, DHHS; and the Chief Medical Director of the Veterans Administration.

Charge to the Council

The charge to COGME is broader than the name would imply. Title VII of the Public Health Service Act, as amended, requires COGME to provide advice and recommendations to the Secretary and Congress on the following issues:

1. The supply and distribution of physicians in the United States.
2. Current and future shortages or excesses of physicians in medical and surgical specialties and subspecialties.
3. Issues relating to international medical school graduates.
4. Appropriate Federal policies with respect to the matters specified in items 1-3, including policies concerning changes in the financing of undergraduate and graduate medical education (GME) programs and changes in the types of medical education training in GME programs.
5. Appropriate efforts to be carried out by hospitals, schools of medicine, schools of osteopathy, and accrediting bodies with respect to the matters specified in items 1-3, including efforts for changes in undergraduate and GME programs.
6. Deficiencies and needs for improvements in data bases concerning the supply and distribution of, and postgraduate training programs for, physicians in the United States and steps that should be taken to eliminate those deficiencies.

In addition, the Council is to encourage entities providing graduate medical education to conduct activities to achieve voluntarily the recommendations of the Council specified in item 5.

COGME Reports

Since its establishment, COGME has submitted the following reports to the DHHS Secretary and Congress:

- First Report of the Council (1988)
- Second Report: The Financial Status of Teaching Hospitals and the Underrepresentation of Minorities in Medicine (1990)
- Scholar in Residence Report: Reform in Medical Education and Medical Education in the Ambulatory Setting (1991)
- Third Report: Improving Access to Health Care Through Physician Workforce Reform: Directions for the 21st Century (1992)
- Fourth Report: Recommendations to Improve Access to Health Care Through Physician Workforce Reform (1994)
- Fifth Report: Women and Medicine (1995)
- Sixth Report: Managed Health Care: Implications for the Physician Workforce and Medical Education (1995)
- Seventh Report: Physician Workforce Funding Recommendations for Department of Health and Human Services' Programs (1995)
- Eighth Report: Patient Care Physician Supply and Requirements: Testing COGME Recommendations (1996)

- Ninth Report: Graduate Medical Education Consortia: Changing the Governance of Graduate Medical Education to Achieve Physician Workforce Objectives (1997)
- Tenth Report: Physician Distribution and Health Care Challenges in Rural and Inner-City Areas (1998)
- Eleventh Report: International Medical Graduates, The Physician Workforce, and GME Payment Reform (1998)
- Twelfth Report: Minorities in Medicine (1998)
- Thirteenth Report: Physician Education for a Changing Health Care Environment (1999)
- Fourteenth Report: COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals (1999)

COGME Resource Papers

- Process by which International Medical Graduates are Licensed to Practice in the United States (September 1995)
- Preparing Learners for Practice in a Managed Care Environment (1997)
- International Medical Graduates: Immigration Law and Policy and the U.S. Physician Workforce (1998)
- The Effects of the Balanced Budget Act of 1997 on Graduate Medical Education (2000)

Other COGME Publications

- Council on Graduate Medical Education: What is it? What has it done? Where is it going? (2000)

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Evaluation of Specialty Physician Workforce Methodologies

INTRODUCTION

Over the past 20 years, numerous attempts have been made to analyze and project the optimal size and specialty mix of the physician workforce. The effort was stimulated by a growing involvement of governments, both State and Federal, in financing undergraduate and graduate medical education. In recent years, this effort has expanded to include separate analyses of a number of medical specialties.

Over the years policy makers have been given conflicting information from varying sources on physician workforce needs. Some professional specialty societies have claimed real or pending shortages while others have purported sufficient or an excess of practitioners in their disciplines. In order to help determine the validity of such claims, COGME, in the fall of 1998, contracted with the Council of Medical Specialty Societies (CMSS) to conduct a study which would review the specialty workforce literature. It was not the intent to critique the conclusions of previous studies, but rather to determine study parameters that would be useful to consider while judging the utility of workforce analyses. In light of a rapidly changing health care system, fueled by technological growth and an evolving marketplace, a re-examination of existing workforce models and development of new models were considered important undertakings.

The goals of the study were to:

1. Assess the methodological strengths and weakness of existing specialty workforce studies.
2. Obtain expert opinion regarding specialty-specific research issues.
3. Develop recommendations regarding the manner in which specialty workforce analyses should be conducted in the future.

To accomplish these goals, CMSS contracted with Richard A. Cooper, M.D., Director of the Health Policy Institute at the Medical College of Wisconsin, to conduct the study. Dr. Cooper assembled a Workforce Research Group that included:

- **David C. Goodman, M.D.**, Dartmouth Medical School
- **Matthew Menken, M.D.**, Robert Wood Johnson Medical School
- **Edward S. Salsberg, M.P.A.**, State University of New York-Albany
- **Michael E. Whitcomb, M.D.**, Association of American Medical Colleges

Ninety studies and reports from thirty-three specialties and subspecialties were analyzed by three members of the Research Group. The majority of studies and reports had been published between 1990 and 1999, while several from the 1980's were examined for historical purposes.

On April 9-10, 1999, the first of two meetings was held with representatives of national medical specialty societies. This meeting was devoted to a discussion of the general issues surrounding existing research of the specialty physician workforce. Particular attention was given to elements that should be considered in constructing future assessments of specialist workforce supply and demand.

Representatives of national medical specialy organizations met again on October 1-2, 1999. The purposes of this meeting were to: (1) review the information that had been obtained from analyses of previously published studies, (2) review the compendium of considerations that had been developed as a result of the first meeting, and (3) develop recommendations for future specialty workforce analyses.

From the review of specialty workforce literature, it became apparent that the processes of measuring and projecting specialty physician supply and demand encounter a broad range of questions. The questions fall into five general categories: *specialty supply and practice*, *residents and fellows*, *specialist supply projections*, *specialty services projections*, and *factors affecting future demand.* There was substantial information available in the literature to answer some questions while for others there was ambiguity. Issues arose about uniformity of methodological approach across studies and about appropriate interpretation, given that specialties vary in size and in the type of services they provide.

The report that follows reviews and summarizes previously published specialty workforce studies, discusses study limitations, and describes the complexities inherent in this type of research. Attention is given to various models that have guided data collection and analyses in the past. Appendix A lists the studies that were reviewed. Appendix B identifies the goals and strategies of the studies by

specialty area. Appendix C contains the major findings from the literature review, and therefore, is a rich source of information on specialty workforce analyses. Summaries and critiques for each specialty area are given in a format that should prove useful to researchers in the specialty workforce field. With recognition that the development and structure of workforce studies is not an exact science, Appendix D provides one example of a conceptual framework that may be considered when future studies are designed. Appendix E lists the participants on the CMSS Specialty Workforce Advisory Committee.

BACKGROUND

One of the responsibilities of the Council on Graduate Medical Education (COGME) is to advise and make recommendations to the Secretary of the Department of Health and Human Services and Congress on the supply and requirements of physicians in the United States, including current and future shortages or excesses of physicians in medical and surgical specialties and subspecialties.

COGME in its Third Report (1992), Fourth Report (1994), and Seventh Report (1995) recommended limiting the number of first year residency positions to 110% of U.S. medical school graduates. COGME's Eighth Report (1996), entitled "Patient Care Physician Supply and Requirements: Testing COGME Recommendations," reevaluated underlying assumptions, methodologies, and data used in previous supply and requirements analyses. The Report repeated earlier recommendations that total first year residency positions be reduced to 110% of 1993 medical school graduates and that 50% of this number enter practice as generalists.

COGME has generally concluded that there are too few generalists (i.e., family physicians, general internists and general pediatricians) and too many nonprimary care specialists and subspecialists. It is not entirely surprising that physician workforce studies, varying widely in their research assumptions and methodologies, have not drawn uniform conclusions. At various times there have been indications of possible shortages in certain physician specialties (e.g., general surgery, preventive medicine, geriatric medicine, and nephrology). Thus, questions still remain as to whether there is a specialty physician surplus or shortage and what the appropriate generalist/specialist mix of physicians should be.

In March 1995, the Bureau of Health Professions in the Health Resources and Services Administration, with support of the Council of Medical Specialty Societies, the American Medical Association, and the Association of Colleges of Osteopathic Medicine, sponsored a national conference on estimating medical specialty supply and requirements in a changing health care workforce. Representatives of medical specialty associations, leaders of academic medicine, and researchers and policy makers participated in the deliberations. The studies of physician specialty supply and requirements presented during the conference fell within the areas of Anesthesiology, General Surgery, Gastroenterology, Otolaryngology, Family Medicine, Ophthalmology, Radiology, Pathology, Osteopathic Medicine, Plastic and Reconstructive Surgery, and Neurology. Among the recommendations from the conference were that specialties should consider collaborative studies of issues that cross specialty lines and should undertake simple assessments of program directors' experiences in placing graduates and filling residencies.

At the May 1998 COGME meeting, Council members requested a review and assessment of existing physician specialty workforce studies and recommendations for possible next steps in the analysis of physician specialty workforce supply and requirements.

SPECIALTIES ANALYZED

The literature review in this report drew upon studies of physician specialties since 1990 that were made available by specialty organizations comprising the CMSS or identified through a literature search. In some instances, reports prior to 1990 were included for historical purposes. A total of 90 studies, reports, and discussion papers representing 33 specialties and subspecialties were reviewed (Appendix A). The general characteristics assessed in these documents are listed below. Because some studies assessed more than one workforce characteristic, the total number is greater than 90.

Discussion paper	**28**
Surveys of practitioners	**19**
Surveys of residents	**11**
Current services	**6**
Supply, distribution, gender	**7**
Projected supply	**8**
Projected supply & demand	**26**
Adjusted needs model	7
Demand-utilization model	15
Requirements model	2
Socio-demographic model	2
	105

The review of this body of information led to an appreciation of the broad range and complexity of issues that must be addressed in order to make reasonable projections of future needs for specialty physicians and future demand for training programs to meet those needs. The sections that follow catalogue these complexities and issues. The Appendices provide a rich and valuable source of information on the specialty physician workforce.

* **Appendix A** lists all studies analyzed.
* **Appendix B** identifies goals and strategies of the various studies by specialty.
* **Appendix C** contains in-depth reviews and critiques of the workforce analyses conducted in each specialty.
* **Appendix D** provides one example of a conceptual framework to study the physician specialty workforce.
* **Appendix E** lists the names of consultants and participants attending the Advisory Committee meetings.

CONSIDERATIONS FOR SPECIALTY PHYSICIAN WORKFORCE STUDIES

Efforts to measure and project the supply and demand of specialty physicians encounter a broad range of questions. These questions fall into five general categories, briefly outlined below. The questions for which substantial information is available are listed in bold type. Those in plain type are associated with greater degrees of ambiguity. The ability to answer these questions is further influenced by the characteristics of the particular specialty being studied, such as its size and the uniqueness of the services that it provides.

SPECIALTY SUPPLY AND PRACTICE

- **How many specialists are there?**
- **Where are they?**
- **What work do they do?**
- **What other professionals do the same work?**

RESIDENTS AND FELLOWS

- **How many residents are there?**
- **How many residents will there be?**

SPECIALIST SUPPLY PROJECTIONS

- **How many specialists will there be?**
- How much effort will they apply to practice?
- How productive will they be?

SPECIALTY SERVICES PROJECTIONS

- How much specialty care is needed now?
- How much will be needed in the future?
- What other professionals will provide this care?

FACTORS AFFECTING FUTURE DEMAND

- **What will be the effects of changes in birth rate, age, and** eth**nicity of the population on future demand?**
- What will be the effects of organizational, economic, technological, and other factors?

MEASURING SPECIALIST PHYSICIAN SUPPLY

Sources of Data for Physician Supply

The measurement of physician supply requires a reliable means of enumerating specialists. Self-reported specialty designations may over-estimate the number of specialists since physicians tend to report their highest training level whether or not that represents their customary level of practice. For this and other reasons, available sources of data did not always provide consistent numbers of specialists. It is important to reconcile various data sources in order to determine the operationally correct number of specialists. These data sources include:

- Master Files of the American Medical Association (AMA)
- Master Files of the American Osteopathic Association (AOA)
- State medical licensure boards
- Specialty certifying boards
- Specialty and subspecialty society member lists
- Mailing lists of professional publications

Defining the "Physicians" Who Are Counted

There was inconsistency in the definition of **"physician"** and whether or not osteopathic physicians are considered. There also was variation in the way that residents and fellows have been counted. Of the categories listed below, **"patient care physicians"** (with some accommodation for residents and fellows) is the one that is most applicable to studies of health care needs. **"Active physicians"** further includes other physician roles that

must be considered when defining the training needs of a specialty.

- **MD and/or DO physicians**
- **Total physicians** – all physicians, whether professionally active or retired
- **Active physicians** – professionally active physicians (usually defined as >20 hours/week), whether or not they are involved in patient care
- **Patient care physicians** – physicians and residents involved in patient care
- **Practicing patient care physicians** – patient care physicians, excluding residents
- **Residents and fellows** – the number of trainees involved in patient care, usually reduced to 35-85% effort to adjust for the relative amounts of care that are provided by trainees versus practicing physicians
- **Residents and fellows in non-clinical roles** – the inclusion of research fellows

Definition of "Specialists"

Previous specialty workforce studies varied in how they defined specialists. The following subsets have been used:

- Graduates from a particular type of residency/ fellowship program
- Diplomates of a particular certifying board (assumptions are made concerning the proportion of specialists who are board-certified)
- Members of a particular association (assumptions are made concerning the proportion of specialists who are members of the association)
- Self-designated specialists

Analysis of Geographic Distribution

Considerable geographic variation exists in per capita physician supply overall and in the distribution of individual specialties. Of significance in workforce planning is the fact that the magnitude of this variation is large in comparison to the magnitude of most of the physician shortages or surpluses that have been modeled over time. The correlation between primary care and specialty physician supply and the lack of any detectable relationship between disease burden, physician supply, and overall health outcomes of the population suggest that not all of the determinants of physician location are related to standard measures of clinical need. One factor that correlates with this geographic variation is personal income. The location of training programs may also partly explain where physicians practice. These geographic disparities confound the ability to project accurately the utilization of physician services in the future.

Geographic distribution was assessed in a number of ways as listed below. One way focuses on contiguous geographic units, such as States, counties, or ZIP codes. A second uses defined hospital or medical service areas. A third focuses on population areas defined by their demographic characteristics (urban, rural, etc). A fourth looks at medically underserved areas, and a fifth looks at distribution from the perspective of practitioners. All are valid, but they each serve different purposes. Unfortunately, relevant information is not available for each of these geographic units.

- **States** – 50 plus the District of Columbia
- **Counties** – 3,141 nationally
- **Metropolitan Statistical Areas** – 273 nationally (Office of Management and Budget)
- **Metropolitan and Non-Metropolitan Counties** – 836 and 2,305 respectively (U.S. Department of Agriculture)
- **Urban-Rural Continuum** (Department of Agriculture, Office of Management and Budget, Census Bureau)
- **ZIP Codes** – approximately 42,000 nationally
- **Hospital Service Areas** – 3,436 nationally (Dartmouth Health Atlas)
- **Health Care Service Areas** – 803 nationally (National Center for Health Statistics)
- **Hospital Referral Regions** – 306 nationally (Dartmouth Health Atlas)
- **BEA Economic Areas** – 172 nationally (Bureau of Economic Analysis)
- **Health Professions Shortage Areas (HPSAs)** – approximately 2,600 (Health Resources and Services Administration)
- **Medically Underserved Areas, Physicians (MUA/Ps)** (Health Resources and Services Administration)
- **Geographic Proximity of Members of the Specialty**

Residents and Fellows

Systematic efforts have been made to obtain data regarding the numbers of training programs and their output. Sources such as the Accreditation Council for Graduate Medical Education (ACGME)

Accredited Programs (JAMA Medical Education issue), data from the Association of American Medical Colleges (AAMC), and surveys by specialty societies have used the following data elements:

- Current numbers of training programs
- Current numbers of residents and fellows
- Number completing training
- Number taking certifying exams
- Number entering research or other non-patient care activities
- Total number of PGY-1 residents
- Number of "first time" PGY-1 residents
- Number of IMG residents
- Number of IMG residents remaining in the U.S. after training

ASSESSING SPECIALIST PHYSICIAN PRACTICE

DELINEATING "CLINICAL EFFORT"

Most studies assessed clinical effort, but there has been inconsistency in the elements of clinically-related activity within the category of "clinical effort" as listed below:

- Direct patient care
- Consultation
- Clinical supervision of students, residents, and fellows
- Administration and documentation related to patient care
- Downtime between clinical encounters
- Travel time between sites of care

DEFINING THE SCOPE OF PRACTICE OF SPECIALISTS

Specialties are defined in terms of a set of clinical tasks that are performed and medical conditions that are treated. However, not all of the tasks and conditions that define a specialty are the sole province of that specialty, nor is all of the clinical time of specialists devoted to practicing the specialty with which they are identified. Therefore, assessments of specialist practice involve parallel analyses of the range of services that comprise a specialty, the volume of care encompassed within that range of services, and the degree to which care is provided by specialists within the specialty being considered or by other physicians or non-physician clinicians. These complex issues were addressed to varying degrees in many of the studies that were reviewed. Three types of professional overlap have been considered:

* **OVERLAP WITH PHYSICIANS IN OTHER SPECIALTY DISCIPLINES**

  Physicians outside of the specialty being considered provide a large amount of specialty care. For example, two-thirds of the care in cardiology, neurology, and gastroenterology; 50 percent of the care in dermatology; and 25 percent of the care in radiology is provided by physicians outside the particular specialty discipline.

* **OVERLAP WITH NON-PHYSICIAN CLINICIANS**

  Non-physician clinicians provide many elements of care that are also provided by physicians, including primary care, routine specialty procedures, and case management. As the use of non-physician clinicians was not as prominent among most specialties in the early 1990s as it is today, most studies failed to give it adequate consideration.

* **OVERLAP OF THE SPECIALISTS BEING CONSIDERED INTO OTHER SPECIALTY AREAS**

  Physicians in a particular specialty often provide care within another specialty. For example, approximately 20 percent of the care provided by specialists is primary care.

Assessments of the range of practice and the degree of professional overlap have been aided by a variety of instruments, described in more detail below. Medical care surveys and claims data are objective sources, but they generally fail to encompass the breadth of clinical services of most specialists, and they exclude physician effort devoted to non-clinical roles. In contrast, physician surveys and consensus panels cover a broader spectrum of physician work effort, but they have the disadvantage of being self-reported data that are not recorded contemporaneously with the activities being reported.

* **MEDICAL CARE SURVEYS**

  Surveys performed by the Centers for Disease Control (CDC) and Agency for Health Care Policy and Research (AHCPR) examine various segments of practice. These surveys cover most sites of health care, include the most common diagnoses, and permit an assessment of the prevalence of disorders that are associated with a particular specialty. These surveys are deficient in not including information about all of the specialty disciplines, and for most specialities, the aggregate information does not

encompass the full range of clinical practice. The following aspects of practice have been assessed:

PHYSICIAN OFFICE VISITS – *National Ambulatory Medical Care Survey*

HOSPITAL OUTPATIENT CLINIC VISITS – *National Hospital Ambulatory Medical Care Survey: Outpatient Department Summary*

HOSPITAL EMERGENCY DEPARTMENT VISITS – *Hospital Ambulatory Medical Care Survey: Emergency Department Summary*

OBSTETRIC CARE BY PHYSICIANS AND CERTIFIED NURSE-MIDWIVES – *National Natality Survey*

INPATIENT ADMISSIONS – *National Hospital Discharge Survey* (CDC), *National Inpatient Sample* (AHCPR)

AMBULATORY SURGERY ENCOUNTERS – *National Survey of Ambulatory Surgery*

PATIENT SURVEYS OF PROVIDER UTILIZATION – *National Health Interview Survey*

* **CLAIMS DATA**

  Unlike other advanced countries, the U.S. does not have a single national payment system. Therefore, most claims data are not available for analysis, and those that are available do not cover a cross section of the population. Claims data that have been used include:

  – Medicare Parts A and B
  – Selected private insurance plans
  – Selected group/staff model HMOs
  – Selected managed care plans

* **SELF-REPORTED SCOPE OF PRACTICE**

  Re-certification in certain specialties requires the submission of records of procedures and diagnostic categories of patient care. Several studies surveyed physicians to learn the range of disease codes (ICD-9) and procedure codes (CPT) that define a specialty and to estimate the degree to which specialty care is provided by specialists or other providers. Sources of self-reported data have included:

  – Re-certification data from specialty boards
  – Practitioner survey data
  – Practitioner consensus panels

FACTORS THAT INFLUENCE PHYSICIAN WORK EFFORT AND PRODUCTIVITY

Work effort is a measure of the time devoted to professional activities, whereas productivity is a measure of the output of that effort. The following data elements have been used to gain an understanding of physician work effort and productivity:

* **MEASURES OF TIME**
  – Hours worked per week, weeks worked per year
  – Time spent in "patient care" activities
  – Percentage of patient care effort devoted to the specialty
  – Time spent in non-patient care activities such as teaching, research, administration, and industry

* **MEASURES OF OUTPUT**
  – Patient encounters, such as visits and procedures per week
  – New patients per year
  – Gross patient charges

* **EVALUATIONS OF PRACTICE SETTINGS**
  – Solo practice, group practice, HMO practice, academic practice

* **EMPLOYMENT CONSIDERATIONS**
  – Work effort of employed physicians versus ownership of practice

* **GENDER CONSIDERATIONS**
  – Differential work effort of male and female physicians

* **CONSIDERATIONS OF PHYSICIAN AGE**
  – Average age at entry into practice
  – Relationship between age and work effort

* **LIFE STYLE CONSIDERATIONS**
  – Trends in hours worked
  – Survey data regarding anticipated work effort

A number of interrelated factors that influence productivity were assessed in some of the studies, including:

* **EFFICIENCY OF THE PRACTICE SETTING**
  – Downtime between cases or office visits

* **TRAVEL TIME**
  – Time for clinical administration and documentation

* **EFFICIENCY IN THE DELIVERY OF CARE**
  – Amount of time necessary to accomplish clinical goals (e.g., office visit, therapy session, operative procedure)

* **CONTRIBUTION OF OTHER CLINICAL ASSOCIATES**
  – Residents and fellows
  – Non-physician clinicians

Assessing Physician Work Effort

Physician effort was often estimated in terms of full-time equivalent (FTE) physicians. Calculating FTEs requires information about the total time devoted to professional activities and patient care. This kind of information is usually obtained through surveys of practitioners or the organizations in which they practice. Some surveys entail careful record keeping through the use of daily diaries, but most are based on recall and estimation. There are concerns about the accuracy of such self-reported data. Moreover, many surveys have a small response rate, and that rate appears to be falling. The greatest concern relates to the process of assigning increments of time in defining what constitutes one FTE patient care physician, with a range of approximately 36-46 hours per week. The following is a list of surveys that have been used to assess practice effort:

- **AMA** – *Socioeconomic Survey* (sample survey of physicians)
- **Medical Group Management Association** – *Physician Compensation-Production Survey* (survey of group practices)
- **American Group Practice Association** – *Group Practice Physician Compensation Trends and Productivity Correlations* (survey of group practices)
- **American Association of Health Plans** – survey of HMO members
- **AAMC/MGMA** – *Faculty Practices Activities Survey* (survey of faculty practices)
- **Surveys conducted by specialty organizations**

Methods for Projecting Future Physician Supply

Age Cohort Flow Model

In the studies that were reviewed the age cohort flow model was most commonly used to project future physician supply. This model requires baseline estimates of current supply (expressed in terms of either "active" or "patient care" physicians) and estimates of both the entry of new physicians and attrition of older physicians. While some studies projected total physician supply, most projected FTE physician supply. This latter projection requires additional data and assumptions:

- **Total physician supply** is an enumeration of "head counts" that includes all physicians other than those who are retired.

  Future physician supply *= Current physician supply – Attrition + Residents*

- **FTE patient care physician supply** is a derived estimate that considers not only the number of active (i.e., not retired) physicians but also their degree of activity in relation to a standard amount of activity that is taken to constitute "one FTE patient care physician."

  Future clinical FTE physician supply *= Current FTE clinical supply – Attrition + Residents*

Notes:

Attrition – Measuring attrition requires data on deaths and retirement as well as on changes in professional effort. A number of national and specialty-specific data sources have been used to estimate these variables, but questions exist concerning how valid and current they are and how well they predict future trends. Sources of attrition data include:

- AMA and AOA Master Files
- AMA Socioeconomic Survey
- Surveys of practitioners
- Specialty society data
- Specialty board data (participation in re-certification exams)
- Bureau of Labor Statistics projections

Entry of New Trainees – Projections of future physician supply must include assumptions concerning the future rates of training. Most studies considered a continuation of current training rates. However, some studies modeled various other rates, most commonly COGME's 110:50/50 percent proposal.

Population Estimates for the Calculation of Per Capita Supply

Current estimates and future projections of physician supply are expressed in per capita terms. This process requires not only accurate estimates of the number of physicians but also accurate estimates of the U.S. population. Unfortunately, there have been deficiencies in data supplied by the Census Bureau. Many specialty studies used 1990 Census Bureau projections that underestimated the future U.S. population, thereby causing overestimates of future numbers of specialists per capita. Continued deficiencies in Census Bureau data can be anticipated based on a Supreme Court ruling that bars

the Bureau from carrying out sampling to supplement head counts. Therefore, population projections necessitate a combination of sources:

- Census Bureau measurements and projections
- Modifications of Census Bureau data based on critical assessments of assumptions
- Demographic sources other than the Census Bureau

DEMAND FOR SPECIALISTS

Most specialty workforce studies limited the scope of their analysis to physician supply and related matters. However, 20 percent of the studies that were reviewed, encompassing 18 of the 33 specialties, addressed questions of demand. Four general models were used:

- **Adjusted Needs Models** estimate the current and projected supply of physicians that is required to deal with the perceived burden of disease.
- **Demand-Utilization Models** project the supply of physicians that is required to provide health care services at current levels of utilization.
- **Requirements Models** project the supply of physicians required to fully staff the future delivery system based on current HMO staffing patterns.
- **Socio-Demographic Models** project the effects of socioeconomic and demographic factors on the availability of future practice opportunities for physicians.

The first three of these models employ highly quantitative methodologies that are similar to the analytic procedure first introduced by the Committee on the Costs of Medical Care in 1933 in its historic treatise entitled, "The Fundamentals of Good Medical Care" (published by Lee and Jones). This approach includes three components: dissecting the intricacies of the health care system, reconstructing the entire system from its component parts, and measuring the system using a common metric of time. In contrast to the needs, demand, and requirements models, the socio-demographic models depend principally on trend analysis. In addition to these four comprehensive models, a number of studies assessed the near-term demand for physicians by evaluating their current "job opportunities." These five general approaches are described in further detail in the sections that follow, and their use in the various specialty studies is listed in Appendix B.

ADJUSTED NEEDS MODEL

What workforce is needed to deal with the anticipated burden of disease?

"Need" is based on an understanding of the current and projected prevalence of disease and the capacity of specific specialties to care for that disease burden. This model uses the Delphi technique to build a consensus regarding the incidence of disease, the number of individuals with those diseases who should be treated by the disciplines being studied, the time required to treat those conditions, and the number of physicians necessary to provide that care. It was used by the Graduate Medical Education National Advisory Committee (GMENAC) in its Interim Report to the Secretary of DHHS in 1979 and by Abt in its 1991 Re-examination of GMENAC's 1980 Data on Selected Specialties. Several specialty studies used this method, often with modifications (e.g., basing need on an ideal of what should be rather than on a consensus of what is likely). However, the dependence of this model on recreating the universe of care from epidemiological considerations regarding disease and from hypothetical principles regarding the structure of the system in which that care will be provided, coupled with its need to assign units of time both to the provision of care and physician effort, have seriously handicapped its ability to forecast what actually occurs.

DEMAND-UTILIZATION MODEL

What workforce is demanded by the desire of patients for care?

Demand-utilization models were the most commonly used in the studies that were reviewed. Rather than relying on epidemiologic assessments, "demand" is based on the current levels of utilization, as derived from patient care databases (e.g., National Ambulatory Medical Care Survey, Medicare, etc.) and facility databases (e.g., American Hospital Association). The demand model considers both those patients who are being treated and others who might benefit from treatment. It projects future use based on anticipated changes in demography, financing, and productivity. Data from objective sources are supplemented by the opinions of expert panels. The most serious methodological pitfalls concern whether the databases adequately capture the breadth of clinical and non-clinical activity that constitutes the work of physicians, whether the times assigned to these activities are representative of the actual times required to perform them under a variety of circumstances, and whether the time that physicians commit to work is accurately portrayed.

Requirements Model

What level of staffing is required by health plans now and in the future?

The requirements model builds from a base of data on physician utilization by enrollees of staff/group model HMOs. It is reasoned that these seemingly "closed systems" should be able to account for all the care provided and the physician time necessary to provide it. The actual implementation of this model requires the complete counting of all physician services provided to HMO enrollees, whether by HMO staff or by other physicians, a process that often has been incomplete. Extrapolating this level of staffing to the entire health care system entails additional adjustments for differences in the burden of disease among patient populations and differences in the scope and intensity of care for patients who are inside or outside of such plans. Projecting these requirements into the future entails further assumptions concerning the future prevalence of various kinds of health plans offering various levels of service and staffed with various mixes of providers. It also requires a specific definition of physician effort in units of time (FTE physicians). Most importantly, the index data from which this model is built involves a small and shrinking segment of clinical practice (staff/group HMOs), and the assumptions and extrapolations that are necessary to describe the entire delivery system from this narrow starting point are complicated and tenuous.

Socio-Demographic Models

What factors create an attraction for physicians to practice in various communities?

Socio-demographic studies assess the historic relationship between the decisions of specialists to practice in particular communities and the characteristics of those communities, such as socioeconomic status and age profiles of its citizens, presence of training programs, proximity of competing practitioners, and demographic features of current specialists. The number of specialists needed in the future is calculated based on the prevalence of geographic units with the characteristics that have attracted those specialists in the past. These models add conceptually to considerations of demand by focusing on economic and demographic trends that influence clinical practice and the utilization of clinical services.

Job Opportunity Assessments

What is the job market for new graduates?

Job opportunities have been assessed through surveys of graduating residents and program directors and surveys of employers regarding current and anticipated hiring practices. Caution must be exercised in interpreting these data from trainees and program directors because the results are influenced by the timing of such surveys, with relatively high apparent "unemployment" two months before the end of training but very low unemployment in surveys 4-6 months after training. Moreover, it appears that the prevalence of opportunities is sensitive to small and transient fluctuations in the marketplace, as was recently observed in anesthesiology. Indeed, the publicity given to perceived shortages of opportunities has tended to distort the orderly flow of trainees. Collectively, these assessments sample an immediate time frame and have little predictive value in long range planning. However, they are important aids in the process of estimating the sufficiency of current supply.

Benchmarking

The benchmarking model offers an alternative to the quantitative models discussed above. It analyzes the need for physicians by assessing the levels of utilization of health services in various communities or regions. This approach avoids the difficulties that the quantitative models encounter in determining an "optimal" physician workforce level and an exact amount of effort per FTE physician. Rather, it uses geographic variation in physician supply to identify regions that can serve as the index level of providers in determining needs more generally. Communities with a higher density of providers may be nearer to a maximal supply than communities with lower per capita supply, and choosing a series of benchmarks can allow future projections to be based, in part, on the gradual progression to lesser degrees of geographic disparity. However, little is known about the factors that affect the manner in which health care services become organized within communities over time or about the health care expectations of the citizens of those communities. Therefore, it is often difficult to translate patterns of organization and utilization from one community to another.

Factors Affecting the Future Demand for Specialist Services

Models that project the demand for physician services must necessarily make assumptions concerning the range of services physicians will provide and the volume of service patients will use. However, these assumptions are confounded by uncertainties concerning future changes in demography, technology, economics, information, and the

organization of health care delivery systems. As a result, it is often unclear which diseases and treatment modalities will exist in the future, what volume of service the care will demand, and who will deliver the care. Moreover, these uncertainties tend to be greater when applied to smaller specialties with a narrower technological base. The following is a list of separate issues that impact on the demand for specialty physicians:

Aging of the Population and the Burden of Disease

In most of the adult specialties, future demand is strongly related to the aging of the population. Many studies extrapolated demand based on changes in the number of elderly patients and their increasing burden of disease related to that specialty. However, simultaneous change in technology and the availability of non-physician clinicians create uncertainty about the magnitude of the effect of aging on the future demand for physicians in particular specialties.

Ethnic Composition

Over the next 20 years, the U.S. population is projected to grow by 50 million, 60 percent of which will be non-white, principally Hispanic. The percentage of the population that is white will decrease from 71 percent in 2000 to 64 percent in 2020. In States such as California, which is projected to grow by >40 percent during those years, almost all of the growth will be among Hispanics and Asians. Given these anticipated changes in ethnic mix, the patterns of care among various ethnic groups are an important consideration.

Birth Rate

The demand for some specialists (e.g., obstetricians and pediatricians) is directly related to the birth rate, and the number of births is falling. There is no clear measure of what the future birth rate will be, principally because it is uncertain whether the high birth rates of some ethnic groups (e.g., Hispanics and some immigrant groups) will continue or whether these groups will adopt the lower rates of the larger population overall.

Technology

Many studies incorporated changes in technology into their calculations of future needs. However, most studies carried out 8-10 years ago failed to anticipate current technologies. And while many new technologies add to the demand for services overall, others simply increase the demand for services in one specialty and decrease demand in another. In addition, while newer, high-risk technologies tend to be adopted by specialists, the evolution of safer technologies permits the diffusion of "specialty care" to generalists and non-physician clinicians. Finally, as some technologies become safer and less costly, the populations served tend to grow. The interplay among these various effects of technology confounds the ability to predict the future demand for physicians, in particular specialty disciplines.

System Trends

The U.S. health care system is becoming more managed. Attempts are being made to control costs, either by limiting the volume of service or the level of payment per unit of service. Volume controls have created a confrontation with consumers, who want greater access to specialty care, whereas limitations on reimbursement have created a confrontation with providers. The future balance between controls on volume and controls on reimbursement is difficult to predict. Projections of demand for particular specialties must consider how this balance will influence the volume of care provided and the distribution of that care among specialists, generalists, and non-physician clinicians.

Geographic Variation

There is considerable geographic variation in the per capita concentration of physicians overall and even more marked variation among the individual specialties. In some specialties the differences at the State level are as much as six-fold. It appears that communities differ in the way their health problems are addressed. Variation in their use of specialists may be due to differences in the distribution of responsibility among specialties, between physicians and non-physician clinicians, or between these health professionals and the other governmental and voluntary organizations that provide care for patients. The variation may relate to the values, customs, and expectations of both patients and physicians and appears to be strongly influenced by patients' level of personal income. A lack of a full appreciation for the basis of the current geographic disparities confounds the ability to project physician utilization in the future.

Personal Income

States with higher average per capita incomes have more physicians (particularly specialists) per capita than States with lower per capita incomes.

Overall, spending on health care rises approximately 1.5% for each 1.0% rise in the gross domestic product (GDP), and per capita physician supply rises by a similar magnitude. Therefore, prosperity has a multiplier effect on the demand for physician services. Near-term national prosperity seems likely, but future trends are uncertain. Only a few of the studies that were reviewed incorporated these economic considerations.

Government Spending on Health

Medicare, Medicaid, and other government programs account for almost half of health care expenditures. The Federal government projects a budget surplus in 2005 of approximately $250 billion, an amount that is similar to current Medicare spending. State governments also project surpluses. Voters appear to want health services. If these projected surpluses materialize, it is likely that they will fuel an expansion of health care services. Paradoxically, however, many of these surpluses depend on a contraction in government spending on health care. These dynamics will have a powerful effect on the utilization of health services and, therefore, the demand for physicians.

Uninsured

In recent years the number of uninsured individuals has increased by 1.0 million annually, and the total is now approximately 46 million. While uninsured individuals use fewer early health care services, they use a disproportionate amount of hospital-based care. Expanding coverage to include those who are now uninsured or underinsured has a complex effect on the aggregate use of physician services. None of the studies adequately addressed this matter.

Information

The Internet has led to a sudden surge in patient access to information. This may lead to better patient education and more self-care, thereby decreasing the demand for physician services. It may also lead to a heightened awareness of the potential benefits of health care and an increased consumer demand. These realities have not yet been incorporated into workforce analyses.

Non-Physician Clinicians

A confluence of dynamics has propelled the growth of the non-physician disciplines, both in numbers of practitioners and in their scope of practice. At the same time, system changes have facilitated the distribution of responsibility from physicians to non-physician clinicians. It is likely that there will be continued changes in the range of overlap among physicians and non-physician clinicians as diagnostic and treatment modalities change and as the organization of the delivery of clinical services evolves. The growth limits of this phenomenon are not clearly defined. The interplay between physicians and non-physician clinicians was central to the analyses performed in anesthesiology and ophthalmology, but few other studies adequately addressed these powerful dynamics.

QUANTITATIVE MODELS AND THE "METRIC OF TIME"

An essential feature of studies that assessed both physician supply and demand is their use of the metric of time to describe physician supply and demand. That metric is most commonly expressed in terms of "FTE physicians."

Supply Is Converted to Units of Time (FTE Physicians)

Eq.1:

$$\frac{\text{Supply (head count)} \times \text{Time devoted to clinical (or total) effort}}{\text{Clinical (or total) time per FTE}} = \text{Supply (FTEs)}$$

Supply is assessed either as total physicians or as patient care physicians. Significant methodological difficulties are encountered when these gross expressions of supply are redefined in terms of "FTE physicians." The difficulties relate in part to uncertainties in "head count," although reasonably accurate current estimates and projections are usually possible. Defining the amount of clinical (or total) effort of physicians is more difficult because of the regional variation in practice patterns and the elasticity in professional activities that exists among physicians. However, the greatest error is introduced in setting the amount of time that constitutes "one FTE physician." There is no absolute against which this value can be established. Small variances in the dimension of "time per FTE" in the denominator can lead to large differences in the resulting calculations of physician supply and accompanying estimates of a physician shortage or surplus.

Clinical Services Are Converted to FTE-Equivalent Units

Eq. 2:

$$\frac{\text{Services (visits and procedures)} \times \text{Time per unit of service}}{\text{Clinical time per FTE}} = \text{Services (FTEs)}$$

The process of expressing physician services in units of FTEs is subject to even greater error because of difficulties encountered with each of the three factors included in Eq. 2, thereby compounding the magnitude of error in the final product.

* **SERVICES**

  Estimates of services (visits and procedures) are derived from medical care surveys (e.g., the National Ambulatory Medical Care Survey) and claims data (e.g., Medicare Part B), from epidemiological assessments of the burden of disease, or from extrapolations of HMO staffing patterns. Some studies supplement these data with information obtained through practitioner surveys or consensus panels. Future projections rely on these baseline calculations and additional assumptions concerning, for example, the future prevalence of disease and appropriateness of care. In each case, the volume of service that is assumed must be translated into numbers of visits and procedures, and subsequently into FTEs. This process is short-circuited in the requirements model, which expresses services directly in FTE units. The various sources used in these studies generally fail to encompass the full clinical scope of most specialties, and most fail further in quantitating the non-clinical effort. The degree of error associated with this process is probably substantial, although difficult to quantify.

* **TIME PER UNIT OF SERVICE**

  The time assigned to units of service in Eq. 2 is the factor with the most error. It generally is the "ideal time" associated with providing these services and is similar to the basis for reimbursement. However, there are marked differences among physicians in the efficiency of accomplishing these tasks. Moreover, the "true time" that physicians spend in assuring the provision of clinical services includes other components, such as down-time between visits or procedures, travel time between clinical sites, and time devoted to authorization, billing, documentation, administration, and similar activities. When expressed as an aggregate (rather than in procedure-specific terms), it is probably similar to the time designated as units of clinical service and complicates its use as the basis for calculating the time that physicians devote to their clinical responsibilities. The methodologies for quantitating non-clinical time are even more primitive.

* **TIME PER FTE**

  While significant errors are introduced in measuring services and determining the time allocated for each in the numerator of Eq.2, errors of equal magnitude exist in the denominator. As is also true for supply in Eq.1, this error relates to setting the amount of time that constitutes "one FTE physician." As indicated for Eq. 1, there is no absolute against which this value can be established. However, the error is further exaggerated in Eq. 2 because of discordance between the nature of time in the numerator ("ideal time" per unit of service) and in the denominator ("time" per FTE).

ERROR OF THE "METRIC OF TIME" IN QUANTITATIVE MODELS

Studies using quantitative models have varied in their details of design. Some dissected the system epidemiologically, whereas others dissected it in terms of providers or services. Some focused specifically on the clinical roles of physicians, whereas others included the full breadth of professional activities. Some confined their analyses to quantifiable data, whereas others accommodated the consideration of qualitative information by employing "sensitivity analyses." However, few studies anticipated the changes that subsequently occurred in clinical medicine, such as the evolution to outpatient medicine and ambulatory surgery, the advent of new procedures or the demise of older procedures. Moreover, few foresaw either the changing demands of patients for service or the changing expectations of physicians for personal time, and none addressed the varied non-clinical roles that physicians would assume.

The errors associated with these studies were often estimated. However, the greatest errors were not a result of their basic design, nor of their failure to anticipate future changes in medicine adequately. Rather, as described above, the greatest errors resulted from the underlying methodological process of converting the total effort of a diverse array of physicians and the increments of effort associated with a diverse array of services into a common "metric of time." Moreover, these errors were compounded in a ways that were not always apparent in the final product.

Because of the complex set of assumptions and methodologies required to execute the "quantitative" models, many of their projections were controversial, and in retrospect, failed to characterize accurately the demand for specialists that subsequently evolved.

Future studies of the physician workforce face many of the same dilemmas that were encountered in the past. What diseases and treatment modalities will exist in the future? What volume of service will they generate? How will needed care be financed? Who will provide the care? And how much effort will providers commit to the process? Most importantly, how strong will our economy be and what portion of the national wealth will be devoted to health care services? All of these considerations must be woven into models that set out to define the future provision of physician services. However, these future studies need not encounter the methodological pitfalls associated with the quantitative approaches to workforce modeling that were undertaken in the past.

CONCLUSIONS AND RECOMMENDATIONS

Physician workforce studies conducted by various specialty and subspecialty groups have varied in purpose and approach. Because studies have relied on different estimation models and data sources to project future workforce supply and demand, it was not possible in this study to aggregate specialist enumeration data nor arrive at conclusions about the size and adequacy of the specialist physician workforce.

The intent of the study was a comprehensive review of what was a considerable body of literature in specialty physician workforce and an identification of the elements that should be considered in the future in order to develop a comprehensive picture of the size and scope of the specialist physician workforce. This report summarizes the specialty literature in terms of the nature of the data collected and the workforce models that guide the analyses. Appendix C provides summary information of the studies by specialty area in a concise format that serves as a useful compendium for researchers in the specialty workforce field. A prominent result of the review was an awareness of the high degree of variation among studies in terms of definitions, methodologies, and overall approaches. Existing studies also have numerous limitations, especially in terms of accounting for the complexity and elasticity of the physician workforce market, the broader medical and health care delivery marketplace, and the effects of population growth and technological change.

Consideration was given to how future studies might address currently recognized deficiencies and use appropriate workforce models. An example of a different type of conceptual framework for specialty workforce study is found in Appendix D. The "trend model" of Richard Cooper, M.D., attempts to recognize the diversity of patients, diseases, and physicians as it projects future demand using a process of trend analysis.

On the basis of the findings in this report, COGME recommends the following.

RECOMMENDATION 1

Future analytical efforts in the field of the specialty physician workforce be guided by consideration of the review of the literature and the issues raised in this report.

RECOMMENDATION 2

With recognition of the ever-changing nature of our health care system and its physician workforce, research attention be given to developing models that continually advance the field of specialty workforce study.

RECOMMENDATION 3

Workforce models be developed with an understanding of the strengths and weaknesses of existing models. Care should be exercised to develop models that are valid, unambiguous, and can be operationalized.

RECOMMENDATION 4

Workforce models be tested within specific specialty areas after which they are modified and retested.

APPENDIX A
Studies Analyzed

ALLERGY and IMMUNOLOGY

*** Studies** (*American Acad. Allergy and Immunol.*)

Abt Assoc. ..... Requirements ..... 1990 •

Lewin/ICF ..... Supply ..... 1989 •

* **Papers**

Amer Acad of A&I ..... J Allergy & Clin Imm 93:803-810 ..... 1994 •

Amer Acad of A&I ..... Memo and report ..... 1990 •

ANESTHESIOLOGY

*** Study** (*Amer. Soc. of Anesthesiologists*)

Abt Assoc. ..... Final Report ..... 1994 •

CARDIOLOGY

*** Study Segments** (*Am. College Cardiol.)*

Bethesda conference ..... J Am Coll Cardiol 24:280-328 ..... 1994 •

Undeserved, Academic Health Centers, Partnerships, CV Specialists/ Generalists, Needs/Supply, Pediatric cardiology

* **Study**

Vetrovec, et. al. ..... J. Amer. Coll. Cardiol 26:1125-32 ..... 1995 •

DERMATOLOGY

*** Study Segments** (*Amer. Acad. of Dermatology*)

Loevy Consulting ..... Report (Needs study) ..... 1997 •

Loevy Consulting ..... Report (Survey) ..... 1997 •

Loevy Consulting ..... Report (Ambulatory visits) ..... 1997 •

EMERGENCY MEDICINE

* **Study**

Moorehead ..... Ann. Emerg. Med 31(5) 595-607 ..... 1998 •

Hoffman (ABEM) ..... Ann. Emerg. Med 31(5) 608-625 ..... 1998 •

*** Study Segments**

Holliman (Needs) ..... Acad. Emerg. Med. 4:725-30 ..... 1997 •

Holliman (Supply Proj) ..... Acad. Emerg. Med. 4:731-35 ..... 1997 •

Hasse (Supply/need) ..... Ann. Emerg. Med. 28: 666-70 ..... 1996 •

FAMILY MEDICINE

*** Survey** (*Amer. Acad. Fam. Phys.*)

Kahn ..... JAMA 275:713-715 ..... 1996 •

*** Analysis** (*Amer. Acad. Fam. Phys.*)

AAFP ..... Report ..... 1998 •

GASTROENTEROLOGY

*** Study**

Meyer, Jacoby (supp/practices) (*GI Leadership Council*) ..... JAMA 276:689-694 ..... 1996 •

GENERAL SURGERY

* **Study Segments**

Jonasson (Aging Pop.) ..... In press ..... 1999 •
Kwakwa (W/F Distribution) ..... A. J. Surg 173:59-62 ..... 1997 •
Kwakwa (Residents) ..... JACS 183:425-33 ..... 1996 •
Jonasson (Retirement) ..... Ann Surg 224:574-82 ..... 1996 •
Jonasson (W/F size) ..... JAMA 274:731-4 ..... 1995 •

HEAD and NECK SURGERY

* **Study Segment**

Close (Supply projections) ..... Laryngoscope 105:1081-5 ..... 1995 •

INTERNAL MEDICINE

*** Study** (*Fed Council for Int Med-FICM*)

Lewin and Assoc. ..... Final report ..... 1987 •

* **Study Segments** (*National Study of Internal Medicine Manpower*)

Lyttle, Levey XX (Residents) ..... Ann Int Med 121:435-441 ..... 1994 •
Anderson XIX (Residents) ..... Ann Int Med 117:243-59 ..... 1992 •

NEPHROLOGY

* **Studies**

Kletke (*Renal Phys. Assoc.*) ..... Am J Kidney Dis. 29:781-92 ..... 1997 •
Neilson and Suki (Abt study) ..... Draft paper ..... 1997 •
Abt Assoc. (*Ad Hoc Committee on Nephrology Manpower Needs*) ..... Final Report ..... 1996 •

NEUROLOGY

*** Studies** (*American Academy of Neurology*)

Vector ..... Final Report ..... 1999 •
Ringle (Neurol-1990) ..... Neurol 41:1863-66 ..... 1991 •
Kurtzke (Update) ..... Neurol 41:1-9 ..... 1991 •
Kurtzke (Need) ..... Neurol 36:383-88 ..... 1986 •
Kurtzke (Supply) ..... Neurol 36:1576-82 ..... 1986 •

* **Papers**

Ringle (Number/Kind) ..... Neurol 46:897-900 ..... 1996 •
Engstrom (Role) ..... West J Med 161:331-4 ..... 1994 •
Silberberg (Forces) ..... Ann Neurol 32:813-17 ..... 1992 •
Menken (Oversupply) ..... JAMA 245:2401-3 ..... 1981 •

NEUROSURGERY

* **Studies**

Friedlich (Retrospective demand) ..... J. Neurosurg. (in press) ..... 1999 •
Popp (*State Neurosurg. Soc.*) ..... Residency manpower survey ..... 1998 •
Harrington (*Neurosurg. Soc.*) ..... Surg. Neurol. 47:316-25 ..... 1997 •

* **Practice Survey**

Popp ..... Surg. Neurol. 46:181-5 ..... 1996 •

* **Paper**

Menken (Workload) ..... J Neurol., Neurosurg, Psych 54:921-4 ..... 1991 •

OBSTETRICS and GYNECOLOGY

* **Study** (*Amer. College Obstetrics and Gynecology*)

Jacoby ..... Ob & Gyn 92:450-456 ..... 1998 •
Jacoby ..... Final Report ..... 1997 •

ONCOLOGY (MEDICAL)

* **Study** (*American Society of Clinical Oncology*)

ASCO ..... J Clin Oncol 14:2612-21 ..... 1996 •

OPHTHALMOLOGY

* **Study** (*American Academy of Ophthalmology*)

Rand ..... Final Report ..... 1994 •

ORTHOPEDIC SURGERY

***Study** (*American Academy of Orthopedic Surgeons)*

Lee (Rand) ..... J. Bone & Joint Surg 80-A 313-326 ..... 1998 •

OTOLARYNGOLOGY

* **(Study in progress)** (*American Academy of Otolaryngology*)

Jacoby ..... AHSR (abstract) ..... 1999 •

* **Study Segments**

Anderson (Requirements) ..... Health Serv Res 32:139-52 ..... 1997 •
Jafek (Distribution, 1995) ..... Oto/H&N Surg 115:306-11 ..... 1996 •
Miller (W/F in 2010) ..... Laryngoscope 103:750-3 ..... 1993 •

PATHOLOGY

* **Study Segments**

Vance (Trainees) ..... Am J Clin Path Sup 1:S37-40 ..... 1994 •
Vance (Trainees for 2000) ..... Lab Med 23:412-15 ..... 1992 •
Vance (Problems & Opportunities) ..... Arch Path/Lab Med 116:593-8 ..... 1992 •
Vance (Trainees) ..... Arch Path/Lab Med 116:574-7 ..... 1992 •
Vance (Trainees, 1989) ..... Human Pathol 22:1067-1076 ..... 1991 •

PEDIATRICS

*** Study Segments**

Chang (Geographic distribution) ..... Pediatrics 100:172-79 ..... 1997 •
Stoddard (Primary care, specialists) ..... Arch. Ped. 152:768-773 ..... 1998 •
Brotherton (Women in pediatrics) ..... Ped. Annals 28:177-183 ..... 1999 •

*** Paper**

Amer. Acad. Ped. ..... Pediatrics 102:418-27 ..... 1998 •

PEDIATRIC GASTROENTEROLOGY

*** Study**

Colletti (Ped supply/demand) ..... J. Ped. GI & Nutr 26:106-115 ..... 1998 •

PEDIATRIC SURGERY

*** Survey** (*Amer. Ped. Surg. Assoc.*)

O'Neill ..... J Ped Surg 30:204-213 ..... 1995 •

PHYSICAL MEDICINE and REHABILITATION

*** Study** (*Amer. Acad. of PM&R, Amer. Bd. of PM&R, Assoc. of Acad. Physiatrists, Amer. Phys. Ed. Council*)

Lewin-VHI ..... Updated Report ..... 1999 •
Lewin-VHI ..... Final Report ..... 1995 •

PLASTIC and RECONSTRUCTIVE SURGERY

*** Study** (*Amer. Soc. of Plastic and Reconst. Surgeons*)

RRC, Inc./Policy Pl. Assoc. ..... Final Report ..... 1994 •

PSYCHIATRY

*** Study** (*American Psychiatric Assoc.*)

Scully ..... Report ..... 1994 •

*** Study Segments**

Zarin (Practice Survey) ..... Am J Psych 155:397-404 ..... 1998 •
Dial (Psyc/NPP in HMOs) ..... Am J Psych 155:405-408 ..... 1998 •
Olfson (Practice patterns) ..... Am J Psych 151:89-94 ..... 1994 •
Dorwart (Prof activities) ..... Am J Psych 149:1499-1505 ..... 1992 •
Group on Adv. of Psych. ..... New Roles for Changing Times ..... 1987 •

PSYCHIATRY, CHILD AND ADOLESCENT

*** Study Segment**

Thomas (Supply, distribution) ..... J Am Acad Child Adolesc Psych 39:9-16 ..... 1999 •

RADIOLOGY, RADIATION ONCOLOGY, NUCLEAR MEDICINE

(A) Radiology, Radiation Oncology, Nuclear Medicine Employment Reports

Sunshine (Jobs for grads) ..... JAMA (Letter) in press ..... 1999 •
Lalman (1996* Grads, Rad/RO) ..... Am J Roent 168:301-310 ..... 1998 •
Burkhardt (1996 Pgm Dir, Rad/RO) ..... Am J Roent 169:333-337 ..... 1997 •
Mallick (1996 Hiring, Rad) ..... Radiol 295:479-86 ..... 1997 •

(B) Radiology

*** Study Segments** (*American College of Radiology*)

Sunshine (W/F) ..... Jerusalem Conf ..... 1998 •
Deitch (Survey, Rad/RO/NM) ..... Radiol 202:69-77 ..... 1997 •
Janower (Supply/Demand) ..... Radiol 200:545-9 ..... 1996 •
Owen (Sex ratio, Rad/RO/NM) ..... A. J. Radiol. 165:1337-1341 ..... 1995 •
Sunshine (GMENAC-1990) ..... Radiol 182:365-8 ..... 1992 •

(C) Radiation Oncology

*** Studies** (*Amer. College of Radiology, ASTRO Human Resources Committee*)

ACR Research Dept. ..... Report ..... 1997 •
Sunshine (W/F) ..... Int J Rad Onc 35:809-20 and 851-54 ..... 1996 •

(D) Nuclear Medicine

*** Study** (*Society of Nuclear Medicine*)

Clouse ..... J. Nuclear Med 39(7):11-13N ..... 1998 •

RHEUMATOLOGY

*** Study** (*American College of Rheumatology*)

Lewin Group ..... Final Report ..... 1996 •

THORACIC SURGERY

*** Study Segment** (*Am. Assoc. Thoracic Surg.)*

Cohn (Practitioner Survey) ..... J. Thoracic & CV Surg 11:570-585 ..... 1995 •

UROLOGY

*** Study Segment** (*Am. Urological Assoc.)*

Gee (Gallop survey) ..... J. Urology 159(2) 509-11 ..... 1998 •

VASCULAR SURGERY

*** Survey** (*Int. Soc. Cardiovasc. Surgery*)

Stanley ..... J. Vascular Surg 23:172-181 ..... 1996 •

APPENDIX B
Goals and Strategies of Workforce Studies

	Author	Year	Specialty Sponsor?	Goals and Strategies
Allergy/Immunology	*Lewin	1989	Yes	*Survey (practitioners)* re: practice characteristics.
	*Abt	1990	Yes	*Adjusted needs model*: updated and modified GMENAC model to "ideal" levels of care.
Anesthesiology	*Abt	1994	Yes	*Demand model*: based on current procedures and time/procedure, adjusted for future age demographics and various levels of participation by CRNAs.
Cardiology	Vetrovec	1993	Yes	*Survey (practitioners*) re: practice characteristics and overlaps with other physician specialists and NPCs; future trends.
Dermatology	*Loevy	1997	Yes	*Survey (practitioners)* re: practice characteristics and overlaps with other physician specialists. *Demand model*: based on aging population.
Emergency Medicine	Hasse	1996	No	*Current demand*: observed utilization vs. standard formulas.
	Holliman	1997	No	*Supply*: Board certified Emergency Physicians (EPs) *Current demand*: based on number of emergency departments (EDs) × assumed number of EPs necessary per ED.
	*Lewin	1997	Yes	*Survey of EDs:* re: numbers of physicians in EDs and percentage who are EPs (± boards).
	Hoffman	1998	Yes	*Survey (programs)* re: residents and residency positions
Family/Gen. Practice	Kahn	1996	Yes	*Survey (practitioners)* re: careers maintained by graduates of FP residencies.
Gastroenterology	*Jacoby	1996	Yes	*Supply:* current supply. *Supply projections:* @ different resident levels. *Services:* spectrum of gastroenterology practice and its contribution to GI care from NACMS, Medicare, AMA-SMS, etc.
Gastroenterology (Ped)	Colletti	1998	Yes	*Supply:* current supply and distribution. *Supply projections:* @ different resident levels.

	Author	Year	Specialty Sponsor?	Goals and Strategies
Gastroenterology (Ped) ***(Continued)***				*Survey (practitioners)* re: practice patterns; future demand for pediatric gastroenterologists.
General Surgery	Jonasson	1995-7	Yes	*Supply:* supply, demographics, distribution. *Survey (residents)* re: numbers, specialties. *Demand model* based on adjustment for aging population; critique of GMENAC.
Head and Neck Surg.	Close	1995	No	*Supply of H&N surgeons* (members of H&N society). *Supply projections of H&N surgeons*: @ constant resident levels.
Internal Medicine	*Lewin	1987	Yes	*Adjusted needs model:* updated and modified GMENAC model.
	Lyttle/Levey	1994	Yes	*Survey (residents and program dir.)* re: numbers of residents and programs.
Nephrology	*Abt Neilson/Suki	1996	Yes	*Supply:* current supply. *Survey (practitioners)* re: practice effort. *Adjusted needs model* base on ESRD and other roles.
	Kletke	1997	No	*Supply:* current supply and distribution. *Supply projections:* @ different resident levels
Neurology	*Vector	1999	Yes	*Supply:* current supply, distribution, overlaps. *Supply projections:* @ different resident levels. *Demand model* based on economics, demographics, technology, managed care and practice trends.
Neurosurgery	Popp	1996	Yes	*Survey (residency programs and chairs)* re: needs for practitioners, training plans.
	Harrington	1997	Yes	*Survey (practitioners)* re: practice patterns, overlaps with other specialists, future trends.
	Friedlich	1998	Yes	*Journal ads* re: available practice positions.
Nuclear Medicine	Soc. NM	1992	Yes	*Survey (practitioners)* re: practice effort.
	Clouse	1998	Yes	*Demand model* based on CTP procedures × time. *Requirements model* based on HMO staffing.

	Author	Year	Specialty Sponsor?	Goals and Strategies
Obstetrics & Gyn.	*Jacoby	1998	Yes	*Supply:* current supply, distribution. *Supply projections:* @ different resident levels. *Services:* spectrum of ob/gyn practice and its contribution to ob/gyn care from NACMS, NNS, AMA-SMS, etc.
Oncology (Medical)	ASCO	1996	Yes	*Survey (practitioners)* re: practice effort.
Ophthalmology	*Rand	1995	Yes	*Supply:* current FTE supply of ophthalmologists and optometrists. *Adjusted needs model* based on incidence, prevalence and time per element of care assuming full access. *Demand model* based on NAMCS, Medicare, etc. to assess utilization (rather than current number of ophthalmologists), adjusted for age demographics.
Orthopedic Surgery	*Rand	1998	Yes	*Survey (practitioners)* re: practice effort. *Supply:* current FTE supply including FTE residents. *Supply projections:* @ constant resident levels. *Demand model* based on total number of encounters (NAMCS+NHDS+NHAMCS, etc.) × time per encounter adjusted for age/sex demographics.
Otolaryngology	Miller	1993	No	*Supply projections:* @ constant resident levels.
	Jafek	1996	No	*Supply:* current and 1972 supply, distribution.
	Anderson	1997	No	*Adjusted needs model* (GMENAC method) *Demand model* based on current utilization adjusted for demography, insurance, physician productivity. *Requirements model* based on 3 HMOs and Weiner's adjustments.
	*Jacoby	1999	Yes	*Supply*: current supply, distribution. *Supply projections:* @ different resident levels. *Services:* spectrum of oto practice and its contribution to oto care, from Medicare, private insurance claims.
Pathology	Vance	1991-93	No	*Survey (pathology chairs)* re: residency positions and residents.

	Author	*Year*	*Specialty Sponsor?*	*Goals and Strategies*
Pediatrics	AAP	1996	Yes	*Demand* based on visits per child × children / pediatrician + FP/GP productivity.
	Chang	1997	No	*Supply:* 1982 and 1992 supply, distribution.
	Brotherton	1999	Yes	*Survey (practitioners)* re: practice effort of women.
	Stoddard	1999	No	*Survey (practitioners)* re: perceptions of the provision of primary and specialty care by primary care and subspecialty pediatricians.
Pediatric Surgery	O'Neill	1995	Yes	*Supply* = members of APSA. *Supply projections:* @ constant resident levels.
Physical Medicine	Lewin	1995/1999	Yes	*Supply:* current supply, distribution. *Supply projections:* @ different resident levels. *Demand (sociodemographic-physician choice) model* based on factors associated with choice of practice location in the past (e.g., neurologists, PTs, orthopedic surgeons, HMOs, patients >65, etc.) and anticipated changes in these factors in the future.
Plastic Surgery	*RRC, Inc	1994	Yes	*Supply:* supply, distribution in 183 economic areas. *Supply projections:* @ different resident levels. *Demand (sociodemographic-patient demand) model* based on the relationship between the volume of service utilized and the socioeconomics and demographics of 183 economic areas, projected based on anticipated changes in these characteristics. *Demand (sociodemographic-physician choice) model* based on the relationship between the choice of practice sites and factors such as the proximity to training programs and the socioeconomic demographics of economic areas; projections based on anticipated changes in these characteristics.
Psychiatry	APA	1992-98	Yes	*Survey (practitioners)* re: practice characteristics and practice effort.
	Dial	1998	Yes	*Current utilization in managed care* based on an analysis of 30 staff/group HMOs.

	Author	Year	Specialty Sponsor?	Goals and Strategies
Psychiatry, Child	Thomas	1999	No	*Supply:* current supply, distribution.
Radiology	Sunshine	1992-99	Yes	*Adjusted needs model:* critique of GMENAC. *Demand:* critique of factors confounding projections. *Survey (practitioners)* re: practice characteristics and practice effort. *Survey (residents, programs and radiology groups)* re: numbers of residents, programs, jobs available and jobs taken.
Radiation Oncology	Sunshine	1996-97	Yes	*Survey (residents, rad.onc. groups)* re: jobs available, jobs taken.
	ASTRO	1996	Yes	*Demand model:* based on anticipated growth in the number of patients with cancer.
Rheumatology	*Lewin	1996	Yes	*Supply:* current supply, distribution. *Supply projections:* @ different resident levels. *Demand model* based on current utilization, adjusted for demography. *Demand model* based on current utilization adjusted for demography, managed care, and unmet needs.
Thoracic Surgery	Cohen	1992	Yes	*Survey (practitioners)* re: demographics, practice characteristics, effects of managed care, and future trends.
Urology	*Gallup	1998	Yes	*Survey (AATS and STS members)* re: demographics, practice characteristics, and future trends.
Vascular Surgery	Stanley	1996	Yes	*Survey (practitioners)* re: demographics, practice characteristics and future trends. *Services:* spectrum of vascular surgery practice and its contribution to vascular procedures (from NHDS).

* Contractor

APPENDIX C
Specialty Summaries

Allergy and Immunology
Anesthesiology
Cardiology
Child and Adolescent Psychiatry
Dermatology
Emergency Medicine
Family Practice
Gastroenterology (Adult and Pediatric)
General Surgery
Internal Medicine
Nephrology
Neurology
Neurosurgery
Nuclear Medicine
Obstetrics and Gynecology
Oncology (Medical)
Ophthalmology
Orthopedic Surgery
Otolaryngology and Head and Neck Surgery
Pathology
Pediatrics
Pediatric Surgery
Physical Medicine and Rehabilitation
Plastic Surgery
Psychiatry
Radiology
Radiation Oncology
Rheumatology
Thoracic Surgery
Urology
Vascular Surgery

ALLERGY AND IMMUNOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. The National Allergy and Immunology Manpower Study. Fairlie, VA: Lewin and Associates. 1989.	T				T	T			
2. Preparation of Needs-Based Requirements for Allergy and Clinical Immunology for the Year 2010". Bethesda, MD: Abt Associates, Inc. 1990					T			T	
3. Brown DE. "Summary of the June 5th Clinical Immunology Meeting". Bethesda, MD: Abt Associates, Inc. 1990						T		T	
4. Anderson JA, Cohen SG, et al. "Will the Supply of Allergists and Immunologists in the United States Meet Future Needs?" J Allergy Clin Immunol, 93 (1994) 803-810.	T	T	T	T				T	
Data Sources									
AMA and/or AOA Master File	T	T			T				
Specialty Association and Board Files	T	T	T	T	T				
Practitioner Surveys for Specialty						T			
Consensus Groups and/or Interviews		T						T	
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)						T	T	T	
Claims Data						T			
Resident/Program Director Surveys									

Overview of Studies

This set of studies provides a comprehensive picture of the supply of and demand for Allergists and Immunologists in the U.S. in the early 1990s. They provide data on both the supply of specialists (based on surveys of practitioners) and the requirements for specialists (using "needs based" methodologies). Study #1 summarizes a survey of a sample of members of the Joint Council on Allergy and Immunology. The report, which includes a variety of basic data on the demographic and practice characteristics of the respondents, shows 5-fold differences in the numbers of specialists per capita across regions in the U.S.

The needs-based estimates in study #2, which used methods similar to those of GMENAC, are particularly thorough. The study concludes that the GMENAC projections were much too low.

Study #3 presents estimates by a panel of experts of the incidence/prevalence rates for more than 30 medical conditions or procedures that require attention by allergists and immunologists. These estimates can serve as the basis for assessments of the need or demand for allergists and immunologists.

Study #4 assesses whether there will be enough allergists in 2010 and 2020 to meet the needs of the public. Drawing on data from previous studies (above) and the AMA, the study examines the impact of possible reductions in A&I residency programs and conclude that, if cuts are made, there will be too few specialists.

ALLERGY AND IMMUNOLOGY

Physician Supply, Current and Projected

Two of the studies (#1 and #4) addressed the question of the supply of allergists and immunologists in the U.S. The former was a survey of a sample of practitioners who were members of the Joint Council of Allergy and Immunology to develop a statistical profile of the demographic and practice characteristics of the specialists. The latter study included projections of the future supply of A&I specialists from a model developed by the Bureau of Health Professions, which used data from the AMA Master File. This model estimated that the supply of A&I specialists would increase from 4401 in 1995 to 5615 in 2020 (28%). The study included an assessment of the impact on the supply of cuts in residency training programs comparable to those proposed by COGME and PPRC, and concluded that the cuts would result in significant reductions in the growth of A&I specialists which would in turn result in greater shortfalls relative to need. None of these estimates accounted for differences in productivity documented for female physicians.

Residents and Fellows, Current and Projected

Neither of these studies examined GME explicitly, although the supply projections in study #4 did simulate the impact of downsizing A&I residency training programs.

Physician Demand/Need/Requirements, Current and Projected

The primary focus of studies #2 was the estimation and projection of requirements for A&I specialists in the U.S. The estimates were developed using a systematic, detailed process similar to that used by GMENAC and guided by panel of experts. The process starts with incidence data of allergic and immunologic problems, which are then adjusted downward to reflect realistic possibilities of treatment by the current supply of A&I specialists. The adjusted incidence rates are then translated into total service requirements by applying specialty-specific norms of visits per case adapted from the original GMENAC estimates by the panel of experts. The total service requirements were then translated into physician requirements based on AMA and NAMCS productivity levels for visits and hours of work, and different scenarios of delegation of services to specialists versus generalists. Separate models were developed for Adult Allergy Care, Pediatric Allergy Care, and Clinical Immunology. The study also developed estimates of the possible impact on requirements of a continued shift toward managed care, using Kaiser/HMO productivity data.

In addition to developing the basic projections for 2010, sensitivity analyses were conducted to establish upper and lower bounds on the requirements estimates based on variations in the population estimates by the Census Bureau, as well as in variations in the extent of delegation of procedures to nonphysician practitioners.

This report takes pains to document the various procedures, data, sources, and assumptions used in developing the requirements estimates.

Interface Issues, Current and Projected

Neither of these studies addresses interfaces of A&I specialists with other specialties or with other health professions and occupations.

Comments and Critique

These studies take a comprehensive approach to at a small and heterogeneous group of allergy specialists (adult, pediatric, research, academic, community). However, the level of quantitative detail adopted causes them to presuppose activities that may or may not transpire, include incidences of disease that may or may not occur, model patterns of care (A&I vs. Primary Care vs NPCs) that are difficult to predict, and ignore the large variations in the per capita concentration of allergists in different regions of the country. Noteworthy also is a lack of consideration of the increasing numbers of women A&I specialists.

ANESTHESIOLOGY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Abt Associates, Inc. "Estimation of Physician Workforce Requirements in Anesthesiology". Park Ridge, IL: American Society of Anesthesiologists. 1994.	T		T	T		T		T	
2 Grogono AW. "Employment Obtained by Graduates of Anesthesiology Residencies, 1996".			T				T		T
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files	T					T			
Practitioner Surveys for Specialty									
Consensus Groups and Interviews						T		T	
AMA GME File and NRMP			T						
NCHS Surveys (NHIS, NHDS, etc.)						T		T	
Claims Data									
Resident/Program Director Surveys							T		T

Overview of Studies

These studies describe a set of models and analyses used to assess the need for anesthesiologists and the employment experiences of 1996 graduates of anesthesiology residency programs. Together they provide a sound foundation for understanding the anesthesiology workforce in the U.S. Study #1 is a careful examination of the requirements for anesthesiologists with little attention to the supply. Based on a series of four staffing scenarios (physician-intensive model, first team model, second team model, and CRNA-intensive model), the study estimates the numbers of anesthesiologists and CRNAs that will be required in 2010, with separate estimates for non-obstetric and obstetric procedures, and pain management. Requirements estimates are also provided for nonclinical activities including research, administration, and other activities.

Study #2 summarizes a survey of anesthesiology residency program directors on employment obtained by 1996 graduates of anesthesiology residency programs across the U.S. The survey responses, which were obtained from 68% of the programs in the U.S., suggest that unemployment was lower in anesthesiology than for all specialties, and that starting salaries were somewhat lower (adjusted for inflation) than five years earlier. The survey responses can serve as baselines for comparisons with future surveys.

Study #1 shows clearly that the number of anesthesiologists required in the U.S. depends heavily on the extent to which CRNAs are used, with a range of requirements from 34,093 anesthesiologists for the physician-intensive model (assuming a 50-hour work week) to 14,351 for the CRNA-intensive model (assuming a 62-hour work week). These estimates include both clinical and nonclinical activities. These numbers result in estimates of requirements for anesthesiologists per 100,000 population in 2010 of between 11.4 and 4.8, compared with the "current" value of 9.3 per 100,000.

ANESTHESIOLOGY

Physician Supply, Current and Projected

Neither of these studies devote much attention to the question of the current or future supply of anesthesiologists. Study #1 does present a "current" supply estimate of 9.3 anesthesiologists per 100,000 population in the U.S., but this figure is not carefully defined and discussed.

Residents and Fellows, Current and Projected

Study #2 reports a survey of the 135 anesthesiology programs in the U.S. in the summer of 1996, and 92 (representing 53% of residents) completed the questionnaire. The survey asked a small number of questions about the practice settings and salary levels of residents and fellows graduating in 1996.

Physician Demand/Need/Requirements, Current and Projected

The estimates of the requirements for anesthesiologists in 2010 in study #1 were constructed from estimates of the numbers of inpatient medical and surgical procedures performed in the U.S. (based on NHDS data) times the numbers of hours required for each of the procedures, adjusted for anticipated changes in the population base in the U.S. Separate estimates were developed for surgical procedures and obstetrical procedures. Estimates for outpatient procedures were developed from data from Medicare Part B files. Estimates were also developed for non-clinical procedures and activities of anesthesiologists. A panel of anesthesiologists and CRNAs met three times to review the models, assumptions, and results. The procedures and assumptions used in the study are made explicit in the report.

Interface Issues, Current and Projected

The examination of requirements for anesthesiologists under alternative scenarios of the use of CRNAs in study #1 is one of the most explicit efforts to examine the relationship between a medical specialty and its corresponding nonphysician counterparts in all of these studies.

Comments and Critique

Study #1 is a very comprehensive approach to quantitating the professional effort of anesthesiologists and CRNAs. However, this multistep quantitative process leads to a compounding of errors, both the the errors of commission in estimating the identifiable components and the errors of omission in not including components. Future need is calculated by adjusting current procedures based on the changing age distribution of the population (plus some adjustments for time/efficiency). Unfortunately, the study doesn't test its methodology by comparing the current need for anesthesiologists (as calculated in this way) with current supply, nor does it factor into its projections any future differences in the demand for services or the nature of the services that will be demanded.

The survey in study #2 provides useful insights about the employment of new anesthesiologists.

CARDIOLOGY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Gunnar RM and Williams RG. "Future Personnel Needs for Cardiovascular Health Care", an excerpt form the 25th Bethesda Conference. J Am Coll Cardiol, 24 (8/94) 275-328.	T		T		T	T		T	
2 Vetrovec GW, et al. "Adult Cardiovascular Physician Resources and Needs Assessment Report of the 1992 and 1993 American College of Cardiology Surveys on Physician Training and Resource Requirements". J Am Coll Cardiol, 26, 5 (11/95) 1125-1132.	T					T	T		
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files	T		T			T			
Practitioner Surveys for Specialty	T					T		T	
Consensus Groups and Interviews									
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

These studies provide a relatively comprehensive look at the cardiology specialty, based on existing data sources, special surveys of cardiologists, and a variety of measures of demand and need for cardiology services. Both studies revealed detailed knowledge of the specialty, although data were not provided to support all of the statements and conclusions.

An important emphasis in both studies was on understanding practice patterns and procedures, including numbers of procedures of different types and the use of ancillary personnel, for different classes of practitioners. Study #1 involved six different task forces of experts established by the American College of Cardiology, each examining a different set of issues related to the delivery of and access to cardiology services (underserved populations, changing delivery of care, nonphysician clinicians, generalist-specialist relations, future needs of cardiologists, and pediatric cardiology).

The general conclusion of study #2 (based on survey responses of current practitioners) was that there was a sufficiency of cardiologists and a "perceived" oversupply of invasive cardiologists. As in studies of other specialties, these studies found geographic maldistribution, with preferences of cardiologists running toward "highly technologic practices" in "metropolitan practice locations". Study #1summarized the recommendations of the six task forces, with special emphasis on aspects of the specialty that improve access to care and focus training resources on programs and procedures needed in the future. Also receiving attention was the organization of services, with extensive discussion of relations between cardiologists and other specialists and nonphysician practitioners.

CARDIOLOGY

Physician Supply, Current and Projected

Study #1examined the supply of cardiologists using data collected in four different ACC-sponsored surveys. Three of the surveys were of ACC members (two Membership profiles and one sample survey of the Adult Cardiology Workforce) and the fourth was of a sample of 2,500 primary care physicians. The emphasis in this study was on practice patterns more than estimation of numbers of headcount or FTE practitioners.

The responses revealed some bias in the responses, with a larger proportion of younger cardiologists responding to the survey than older ones. The surveys revealed wide variations in workload, with 39% seeing <=100 patients/month and 2% seeing >800 patients/month. The surveys also revealed that cardiologists perform "a significant amount of primary care". Respondents indicated that they were the primary care source for 30% of their patients, and that they were the primary care provider for another 13% of patients not seen for cardiologic diagnosis.

No supply projections were developed in either of the studies.

Residents and Fellows, Current and Projected

The discussion of residency training was limited to discussions of possible needs for additional or different training for cardiologists in the future. The focus was the adequacy of training rather than the numbers of new cardiologists being produced. However, subsequent surveys in 1995 and 1997 indicated that approximately 2% of cardiologists had difficulty securing employment.

Physician Demand/Need/Requirements, Current and Projected

A key focus of study #1 was access to cardiologic services, and one of the six task forces devoted significant attention to the issue of recruiting practitioners into underserved areas. Here too the emphasis was on identifying strategies for improving access, rather than estimating the numbers of cardiologists needed to serve different populations.

Study #1 reported that "most generalists and cardiovascular specialists do not perceive a need for additional cardiovascular specialists". They also reported that "many providers perform cardiovascular procedures at levels below the recommended threshold for maintenance of clinical competence". Other sources were also cited that reached the same conclusion that the supply of cardiologists will exceed requirements in the near future.

Interface Issues, Current and Projected

Interface issues were prominent in both of these studies. Study #1 considered relationships between cardiologists and both other physician specialists and nonphysician personnel. They concluded that the appropriate boundaries of cardiovascular care between generalists and cardiovascular specialists are "indistinct". They also concluded that additional study was needed to assess possible cost savings and improved clinical outcomes from nonphysician personnel in cardiology.

Comments and Critique

These two studies provide valuable insights and estimates about the need for cardiologists in the U.S., but they do not assess whether the current supply is adequate to meet this need. The 25th Bethesda Conference includes excellent discussions of several important workforce issues (e.g., interface issues). There clearly is a vast overlap between cardiologists and PCPs in all areas of cardiology other than invasive, and these is an increasing use of NPCs, particularly in academic practices.

CHILD AND ADOLESCENT PSYCHIATRY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Thomas, CR and Holzer, CE. National Distribution of Child and Adolescent Psychiatrists. J Am Acad Child Adolesceny Psych, 38:1(1/99) 9-15	T				T				
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files									
Practitioner Surveys for Specialty									
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
AAHP Survey									
Resident/Program Director Surveys									

Overview of Studies

This study is a careful analysis of the geographic distribution of the approximately 4,200 child and adolsecent psychiatrists in the US. in 1990. Distribution was assessed in terms of states, countries (stratified according the the prevalence of youth poverty) and the Urban-Rural Continuum, drawing upon data from the Area Resource File. The range of density of child and adolescent psychiatrists was enormous, with high concentrations in prosperous urban areas and a paucity in rural and poor areas.

CHILD AND ADOLESCENT PSYCHIATRY

Physician Supply, Current and Projected

Supply was analyzed for 1990, to correspond with the available demographic data.
This analysis demonstrated a marked variation in the number of child and adolescent psychiatrists per 100,000 youths:
From <1/100,000 youths in Mississippi to almost 20 in Massahusetts.
From <6/100,000 youths in counties with >30% youth poverty to >18 in counties with <20% youth poverty.
From very few or none in communities with <250,000 people to a mean of 10/100,000 youths in communities with populations of >1,000,000.

Residents and Fellows, Current and Projected

The distribution of C/A psychiatrists did not correlate with the location of training programs.

Physician Demand/Need/Requirements, Current and Projected

The total number of child and adolescent psychiatrists is 45% the number predicted to be needed by GMENAC; however, no easy standard emerges for this analysis. Of note is the striking inverse relationship between the density of child and adolescent psychiatrists and the percentage of children living in poverty.

Interface Issues, Current and Projected

The potential roles of psychologists and clinical social workers was not discussed, although they were considered in the GMENAC model.

Comments and Critique

This is a profoundly interesting analysis, in part because of the meticulous methodology but largely because it reveals such marked geographic diversity in supply. It raises questions about the right supply to meet the demand and the incentives or systems necessary to assure a broader access to that supply.

DERMATOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Loevy SS. "Ambulatory Visits to Dermatologists, 1980-1992". The Loevy Consulting Group. 1996-97.						T	T		
2. Loevy SS. "Practicing Dermatologists: The 1995 Membership Survey of the American Academy of Dermatology". The Loevy Consulting Group.1996-1997	T		T		T	T			
3. Loevy SS. "The Need for Dermatologists: Population-Based Labor Force Requirements". The Loevy Consulting Group. 1996-1997	T					T	T	T	
Data Sources									
AMA and/or AOA Master File	T				T			T	
Specialty Association and Board Files	T				T				
Practitioner Surveys for Specialty	T				T	T			
Consensus Groups and Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)						T	T	T	
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

This set of three studies were commissioned by the Manpower Committee of the American Academy of Dermatology, but they do not represent official policy of the Academy. They dealt with different aspects of the supply of and demand for dermatologists in the U.S. Drawing on data from a variety of sources, they provide insights relevant to policies concerning the specialty of dermatology. The general conclusion of the studies was that the workforce responded to the needs of the public and that more dermatologists would be needed in the future.

Study #1 examined data from NAMCS to obtain physician-patient ambulatory encounters for dermatologists, primary care physicians, and all other specialists for 1980 through 1992. These data revealed changing patterns of visits for dermatological conditions among the three groups of physicians over the 12 year period, and identified a number of factors that appeared to affect the visit patterns. The study concluded that the observed declines in the numbers of visits per year must be attributed to increases in the numbers of dermatologists.

Study #2 summarized the 1995 survey of the members of the American Academy of Dermatology (AAD). This offers a snapshot of the demographic and practice characteristics of dermatologists in the U.S., providing data on gender, age, residency training, practice setting, hours worked, patients per week, and migration patterns of AAD members.

Study #3 developed estimates of the requirements for dermatologists based on a variety of assumptions and data sources, with comparisons to national averages. This study projected the total number of required dermatology visits by applying NAMCS estimates of visits per capita to official age-specific population projections. These estimates of visits

DERMATOLOGY

Physician Supply, Current and Projected

Study #2 provides a profile of the dermatology workforce in the U.S. based on 1995 survey of AAD members. The basic frequency distributions for selected demographic and practice characteristics are supplemented with some discussion of factors related to choice of practice location.

Study #3 reported that the supply of dermatologists more than doubled between 1970 and 1990, from 2,932 to 5,996. The number of dermatologists per 100,000 population increased from 1.4 in 1970 to 2.4 in 1990. If residency training production continues at ealy-1990 levels, the supply per capita was expected to continue to rise in the future.

Residents and Fellows, Current and Projected

None of these studies examined directly the size or characteristics of residency programs. Study #2 does present some insights about the relationship of practice location and residency training location, but concludes that "there is no clear causal relationship between the choice of where to train and where to practice".

Physician Demand/Need/Requirements, Current and Projected

The demand/requirements estimation and comparisons in study #3 were based on analysis of historical utilization patterns of dermatology services. Projections are provided for four alternative scenarios based on adjustments to the ratio of dermatologists per 100,000 population assuming that the demand/requirements might increase from the 1995 levels. These estimates were used essentially to assess the impact of such increases on the supply/demand balance for dermatologists.

Interface Issues, Current and Projected

Aside from comparisons of some statistics for dermatologists and physicians in general, there is no discussion of interface issues in these studies.

Comments and Critique

These studies provide a great many insights about the dermatology workforce in the U.S. However, several points should be noted: 1) The rate of utilization of dermatologists is falling among younger age groups and rising for older age groups. Yet, the projections presented are based on the continuation of the current utilization of dermatologists by various age groups. 2) The study projects a need for more dermatologists in the future as the number of visits rises from 29,000 to 35,000. Yet, the number of visits to dermatologists has been constant from 1980 to 1992 despite aging of the population. 3) Work effort is changing among younger and female dermatologists, but future needs do not consider these trends.

EMERGENCY MEDICINE

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Haase, C, Lewis LM, and Kao B. "Do Estimates of Emergency Physician Workforce Underestimate Current Needs?". Ann Emerg Med, 28:5 (12/96) 666-670.	T							T	
2. Holliman CJ, Wuerz RC, Chapman DM, and Hirshberg AJ. "Workforce Projections for Emergency Medicine: How Many Emergency Physicians Does the United States Need?". Acad Emerg Med, 4: (1997) 725-30.	T	T	T	T				T	
3. Holliman CJ, Wuerz RC, and Hirshberg AJ. "Analysis of Factors Affecting U.S. Emergency Physician Workforce Projections". Acad Emerg Med, 4 (7/97) 731-5.	T	T						T	
4. Moorhead JC, et. al. "A Study of the Workforce in Emergency Medicine". Ann Emerg Med, 31:5 (5/98) 595-607.	T								
5. Hoffman GL, et al. "Report of the Task Force on Residency Training Information, American Board of Emergency Medicine" Ann Emerg Med, 31:5 (5/98) 608-625.			T						
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files (ABEM)	T		T					T	
Practitioner or Agency Surveys for Specialty	T							T	
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP			T						
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

Collectively, these studies address many of the issues related to assessing the supply and demand for emergency physicians (EPs) in the U.S. The studies generally have adopted the position that all emergency departments (EDs) should be staffed by board certified EPs, despite the fact that (because of the relative newness of the specialty) many EDs are currently staffed with non-EM board certified physicians.

Two general conclusions of all of these studies are that 1) current data on EPs and EDs in the U.S. are incomplete, and 2) there is a shortage of board certified EPs in the U.S. The dramatic increase in the production of new EPs will certainly help to address this issue, but it will be some time before there are enough board certified EPs to staff all EDs in the U.S.

Much of the emphasis in these studies is documenting the specialty training and certification of current EPs.

EMERGENCY MEDICINE

Physician Supply, Current and Projected

Estimating the supply of emergency physicians (EPs) is a nontrivial task because the specialty is relatively new and a large proportion of EPs (42% according to study #4) are licensed and trained in other specialties. The focus was on physicians in EDs, and estimates of supply were provided in only studies #4 and #1.

Study #2 provided estimates of impact of different levels of reduction in the numbers of EM residency program graduates. The numbers of EPs were forecasted to grow substantially if current production levels hold. It was estimated that reductions of 50% would be needed to eliminate growth in the number of EPs in the future. A 4% attrition rate was assumed for the supply projections.

Residents and Fellows, Current and Projected

Study #5 presents what is described as the first annual report on residency training in emergency medicine in the U.S. It provides historical data on the number of EM resident training programs since 1975, and on enrollments from 1993-94 to 1997-98. In addition, the study provides data describing the demographic characteristics of EM residents training in the U.S. in 1997-98. The study shows clearly the growth of the specialty and provides a valuable baseline for comparisons with reports in future years. The future production of residency programs was used as a adjustment factor in the simulations of the future supply of EPs presented in study #2.

Physician Demand/Need/Requirements, Current and Projected

The demand/need for EPs is not addressed in a detailed way in these studies. Study #2 approached the problem from the perspective of determining the number of EPs needed to adequately staff all the EDs in the U.S. They concluded that the current staffing ratio of 4.7 EPs per ED derived from 1989 AHA data was a bare bones estimate that means that not all facilities had 24-hour EP coverage. This results in an estimate of 14,000 EPs needed in the U.S. They also constructed an estimate assuming that there must be 21,277 EPs to accommodate the 100 million ED visits annually (assuming 2.5 patients per hour, 40 hours per week, and 47 weeks per year). Adding in non-clinical duties would increase this requirement.

Study #1 provided alternative estimates of "need" based on several formulas and a telephone survey of EDs in Missouri. Their estimates ranged from 5.6 EPs per 100,000 population based on actual Kaiser HMO staffing patterns, to 10.5 per 100,000 cited in a 1995 ACEP study. This study mentioned the need to consider having higher ratios in rural areas than in urban centers.

Interface Issues, Current and Projected

Aside from references to the large numbers of non-EM board certified EPs practicing in EDs, none of these studies addressed interface issues. The extensive and growing use of PAs in EDs was not mentioned.

Comments and Critique

Although these studies reveal many important insights, they suffer from a number of shortcomings that are inherent to the practice of emergency medicine. This is a fundamentally unmeasurable workforce.
While the number of board certified EPs is known, the following are unknown: (1) the current supply board certified EPs practicing in EDs; (2) the attrition of EPs from EM practice; (3) the work effort of EPs; (4) the supply of non-EPs in EDs; (5) the number of EDs now; (6) the number of EDs that are likely in the future, based on hospital closures and mergers; (7) the staffing ratio of physicians in EDs; (8) the contribution of residents (EM and others) in EDs; (9) the current and future contributions of NPCs. Even in terms of current supply, there is conflict between AMA data and data from the ACEP. Other limitations include the lack of geographic differentiation, adjustments for female practitioners and inclusion of NPCs.

FAMILY PRACTICE

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Kahn NB, Schmittling G, Ostergaard D, and Graham R. "Specialty Practice of Family Practice Residency Graduates, 1969 Through 1993: A National Study". JAMA, 275:9 (3/6/96) 713-715.	T					T			
2. Family Physician Workforce Reform: Recommendations of the American Academy of Family Physicians. Kansas City, MO: AAFP. Reprint # 305. 1998.	T			T				T	
Data Sources									
AMA and/or AOA Master File	T			T					
Specialty Association and Board Files	T			T				T	
Practitioner Surveys for Specialty									
Consensus Groups and Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

These two studies provide some basic data concerning the family physician workforce in the U.S. Study #1 examines the extent to which physicians trained in family medicine remained in that specialty. Based on data from the AMA Master File, it found that 91% of physicians completing a family practice residency program indicated that they were practicing in primary care. Emergency medicine was the second most frequent response at 4%. Based on this, the study concluded that family practice residency programs are an effective mechanism for the production of generalist physicians.

Study #2 is essentially a policy statement by the American Academy of Family Physicians regarding family physician workforce reform. Although the findings and recommendations are based on a number of different studies and analyses, the statement presents only the final syntheses that lead to the conclusions and recommendations. The final recommendation is that the number of family physicians per 100,000 population be increased to 35.1 by 2015 up from 33.3 in 1995. This figure reflects adjustments for a number of factors, including higher-than anticipated numbers of general practitioners retiring, an increasing number of family physicians choosing to work less than full time, and a tendency of newer family physicians to work somewhat fewer hours and see somewhat fewer patients. This figure also reflects the growing numbers of DOs entering practice and the growing numbers of PAs and NPs entering practice across the U.S.

FAMILY PRACTICE

Physician Supply, Current and Projected

Study #1 presents the results of an analysis of the AMA Master File that shows the percentage of self-reported family physicians who report their primary specialty of practice as family medicine or some other specialty. By itself, this information has limited value, but it does provide useful insight about the specialty.

Study #2 presents a variety of data related to the supply of family physicians in the U.S., generally in a series of formulae used to justify one or more policy statements about family medicine.

Residents and Fellows, Current and Projected

These studies do not present or analyze data on family medicine residency programs. Study #2 does make recommendations about the future production of new family physicians, based on other analyses and observations.

Physician Demand/Need/Requirements, Current and Projected

Study #2 accepts the general recommendations in the 8th COGME Report that there be 80 primary care physicians per 100,000 population. They further recommend that "family physicians comprise 50 percent of all MD generalists…." This study does not attempt to develop independent estimates of the demand for family physicians.

Interface Issues, Current and Projected

Study #2 does incorporate consideration of the roles of PAs and NPs in providing primary care. The equivalency rate of 0.4 PAs or NPs per physician is based on COGME recommendations drawn from NACNEP (a value that is probably lower than the current substitution ratio).

Comments and Critique

Family practice is a very complex specialty having many relationships with other specialties and other clinical professions. A careful, systematic study of family medicine would require substantially more depth than was possible in either of these studies.

GASTROENTEROLOGY (ADULT and PEDIATRIC)

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Meyer G, Jacoby I, Krakauer H, Powell DW, Aurand J, and McCardle P. "Gastroenterology Workforce Modeling". JAMA, 276 (9/4/96) 689-694.	T	T	T		T	T			
2. Colletti RB, et al. "Pediatric Gastroenterology Workforce Survey and Future Supply and Demand". J Ped Gastro Nutr, 26 (1/98) 106-115.	T	T	T		T	T			
Data Sources									
AMA and/or AOA Master File	T	T			T				
Specialty Association and Board Files		T	T			T			
Practitioner Surveys for Specialty	T	T					T		
Consensus Groups and Interviews						T			
AMA GME File and/or NRMP, NaSIMM			T						
NCHS Surveys (NHIS, NAMCS, etc.)							T		
Claims Data						T	T		
Resident/Program Director Surveys									

Overview of Studies

Study #1 examined the current and projected supply of gastroenterologists in the U.S. in the mid-1990s and the services provided by gastroenterologists and other practitioners. Using available data on the numbers of specialists and GME program sizes, it showed that the supply of gastroenterologists would increase from 3.0 per 100,000 population in 1992 to 5.7 per 100,000 population in 2032 if current levels of production of new specialists continued at then current rates. The study recommended that the number of new gastroenterologists trained in the U.S. be reduced by 25% to 50% over the five years.

Pediatric gastroenterology is a very small subspecialty with fewer than 700 practitioners in 1996. Study #2 describes a survey of these practitioners conducted in 1996 to obtain data describing the demographic characteristics and practice patterns of these specialists. The study also presented estimates of the "demand" for pediatric gastroenterologists based on three different concentrations of pediatric gastroenterologists per million population, with the U.S. population estimated to increase in the future by 1.1% per year. These supply and demand estimates were then compared to determine the extent to which supply and demand were in balance. The conclusion was that, at current levels of production of new specialists by residency programs, the supply would increase from 600 in 1996 to nearly 1,000 in 2006. At the same time demand was projected to grow more slowly, resulting in a oversupply of practitioners by 2006. Three different supply and demand trajectories were developed in the study to reflect alternative views of the future. The study recommended that the number of new pediatric gastroenterologists be reduced by 50% to 75%.

GASTROENTEROLOGY (ADULT and PEDIATRIC)

Physician Supply, Current and Projected

The supply estimates and projections in study #1 were based on two data sources. First, the 5% sample file from the HCFA Medicare Part B file was used to identify the site of service provision, specialty of the physicians providing services, CPT codes, and ICD-9 codes for each gastroenterology service. These data were then translated into estimates of the current supply based on data in the ARF, with estimates of services provided by gastroenterologists, surgeons, and generalists. Projections of future supply were developed using an age cohort flow model. Downward adjustments in supply were made to reflect the lower productivity of women physicians. Rather than use counties as the geographic unit, they used the nation's 803 Health Care Service Areas, which are aggregations of counties. The study showed that the supply was 2.3 gastroenterologists per 100,000 population in 1985, 3.1 per 100,000 in 1992, and would grow to as much as 5.7 per 100,000 in 2032.

The supply aspects of study #2 are based on the results of a practitioner survey of all pediatric gastroenterologists in the U.S. and Canada. With a response rate of more than 90%, the resulting profile of demographic and practice patterns is quite reliable.

Residents and Fellows, Current and Projected

Aside from obtaining estimates of the numbers of residency and fellowship program graduates from NaSIMM for use in the supply forecasts, and making recommendations to reduce the numbers of such graduates in the future, neither of these studies carefully reviewed GME programs for gastroenterology.

Physician Demand/Need/Requirements, Current and Projected

Study #1 assessed the current practice patterns of gastroenterologists and identified the proportion of gastroenterology services that were provided by gastroenterologists. However, it did not attempt to estimate future the need for gastroenterologists because of difficulties in anticipating "future trends in pathology, procedures, and practice that may have a profound effect on the need for certain types of physicians."

The demand estimates developed in study #2 were not based on any model or analytical process. They appear to be judgments of the authors about different levels of service that might be made available to the population.

Interface Issues, Current and Projected

Study #1 examined the extent to which gastroenterology services were provided by three broad classes of physician specialists (gastroenterologists, surgeons, and generalists). The implications of this are not discussed fully.

Study #2 pointed out the interface between pediatric and adult gastroenterologists (the ratio is 1:13) and the involvement of NPCs (16% of ped. gastroenterologists work with NPs or PAs "who provide care independently.")

Comments and Critique

The supply estimates provide valuable data and insights about the future of these specialties. Study #1 acknowledges that future demand cannot be estimated, primarily because a large proportion of service is provided by physicians outside of the specialty. Study #2 surveys practicing specialists concerning whether there are too few, enough or too many pediatric gastroenterologists, but does not assess need in any other way. However, demand is difficult to predict, given the small number of practitioners, the unknown contribution of adult gastroenterologists and the large geographic variation, even within AHCs.

GENERAL SURGERY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Jonasson O, Kwakawa F, and Sheldon GF. Calculating the Workforce in General Surgery. JAMA, 274,9 (9/6/99) 731-4.	T		T						
2. Jonasson O and Kwakawa F. Retirement Age and the Workforce in General Surgery. Ann of Surgery, 224,4 (10/96) 574-82.	T								
3. Kwakawa, F and Jonasson O. The Longitudinal Study of Surgical Residents, 1993 to 1994. J Am Coll of Surg, 183 (11/96) 425-33.			T						
4. Kwakawa, F and Jonasson O. The General Surgery Workforce. Am J of Surg, 173 (1/97) 59-62.	T				T				
5. Jonasson O and Kwakawa F. The Aging of America: Implications for the Surgical Workforce. In Rosenthal, et al, eds, Geriatric Surgery. In Press. 1999.							T	T	
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files			T		T		T	T	
Practitioner Surveys for Specialty	T								
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP			T						
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

This set of studies provides a comprehensive look at the General Surgery workforce. The principal concern is whether the demand/need for general surgeons can be met with the current supply. The studies provide a useful update on the 1980 GMENAC study and the follow-up study by Abt Associates in 1991. For the most part, the studies have a national perspective, with only a few references to state-level and urban-rural differences. They are primarily descriptive in nature. There are no formal models to project the future supply of or demand/need for General Surgeons or to develop target level of General Surgeons per capita.

The general conclusion reached in these studies is that, with a supply of General Surgeons of about 7 per 100,000 population for the past 20 years, the demand/need for General Surgeons continues to be strong. This conclusion is based more on interpretation of data sets and studies of others than on original models and analyses.

GENERAL SURGERY

Physician Supply, Current and Projected

The estimates of the supply of General Surgeons are based on data collected and compiled by the AMA, the ABMS, and the ACS. The production of new General Surgeons is based in part on data on residents collected by the ACS. Estimates of the supply are presented as total supply estimates, often with maximum and minimum numbers. None of these studies present any projections of future supply. Some basic demographics are presented that reveal that minorities and women are underrepresented in General Surgery.

The study of retirement (study #2) found that, despite anecdotes that physician are leaving practice at younger ages, General Surgeons were on average older at retirement in 1994-95 than they were in 1984-85.

Although the trend toward more subspecialization among surgeons was noted, none of the studies attempted to estimate the impact of this on the availability of General Surgeons.

Residents and Fellows, Current and Projected

Residency counts used in the studies came from a continuing study of surgical residents conducted by the American College of Surgeons. They note that production of new surgeons has changed little since the study was initiated in 1982.

No effort was made to study the impact of changing the aggregate production of general surgery residency programs.

Physician Demand/Need/Requirements, Current and Projected

Aside from general commentaries on a variety of different factors influencing demand for General Surgeons, these studies do not examine the demand or need for General Surgeons. There was a discussion in study #5 of changes in surgical care, pharmacology, and other technological breakthroughs that are affecting demand for General Surgery, but no effort was made to quantify the impacts, or to incorporate these factors into numerical estimates.

There was also a general discussion of the impact of changes in health care delivery on the demand for General Surgery. The general conclusion was that managed care reduces the demand for surgery.

None of the studies developed targets for the numbers of General Surgeons required or needed by a population. They were content to indicate that at current supply levels, "the need for General Surgeons remains great".

Interface Issues, Current and Projected

Specific surgical subspecialties are mentioned occasionally, but relationships with General Surgery are not developed in any systematic way. There is no mention of nonphysician clinicians in any of these studies.

Comments and Critique

This series of papers presents a comprehensive picture of general surgery as it currently exists. However, the state-level ratios of General Surgeons per 100,000 population presented in study #4 may obscure much larger differences observed in the smaller hospital referral regions, as presented in the Dartmouth Atlas of Health Care. These studies draw attention to the impact of the growing numbers of surgical subspecialists on the demand for general surgeons. Study #5 points out the potential effects of aging of the population on the demand for general surgeons. It also offers a critique of the needs-based approach of GMENAC.

INTERNAL MEDICINE

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Needleman J, Bracken B, and Fisher K. "Projected Requirements for and Supply of Physicians in Internal Medicine: 1990-2020". Lewin and Associates. 1987.	T	T	T	T			T	T	
2. Anderson RM, Lyttle CS, Kohrman CH, Levey GS, and Clements MM. "National Study of Internal Medicine Manpower: XIX. Trends in Internal Medicine Residency Training Programs". Ann Int Med, 117 (8/92) 243-250.			T						
3. Lyttle CS and Levey GS. "The National Study of Internal Medicine Manpower: XX. The Changing Demographics of Internal Medicine Residency Training Programs". Ann Int Med, 121:6 (9/15/94) 435-441.			T						
Data Sources									
AMA and/or AOA Master File	T	T							
Specialty Association and Board Files									
Practitioner Surveys for Specialty									
Consensus Groups and Interviews									
NRMP and/or NaSIMM			T	T					
NCHS Surveys (NHIS, NAMCS, etc.)									
GMENAC							T	T	
Resident/Program Director Surveys									

Overview of Studies

These studies addressed a number of important aspects of the supply and demand of internal medicine (IM) specialists. Study #1, which was published in 1987, is an update of the GMENAC study conducted nearly a decade earlier. By incorporating the most recent data on population patterns and projections, IMG residents, the medical needs of AIDS patients, and a number of productivity factors, the study found that the requirements for physicians would increase in the future. The supply of physicians was also projected to increase, even if the numbers of IMGs were to remain constant in the future. Comparisons of supply and demand show that requirements exceed supply for General Internal Medicine and for hematology/oncology for virtually all of the variations on the supply and demand models. The analyses showed demand exceeding supply for the other seven IM subspecialties.

Studies #2 and #3 provide a variety of data about IM residency training which is a prerequisite for most IM subspecialty residency programs. They provide important insights about the mix of primary care and specialty care physicians. Study #2 provides a variety of demographic and training program data on IM residents, including gender, race, IMG status, hospital type, and extent of ambulatory care in training. Study #3 summarizes surveys of IM residency program directors in 1990-91, 1991-92, and 1992-93 concerning the present activities of the previous year's third-year residents. It provides a basis for estimating the extent to which IM residents continued in subspecialty training versus entering primary care practice.

INTERNAL MEDICINE

Physician Supply, Current and Projected

Supply estimates are presented only in study #1. Whereas the requirements estimates in this study were based heavily on GMENAC, the supply estimates were based on the then latest supply estimates from BHPr. Some of the assumptions incorporated into the BHPr estimates are: the recent U.S. medical school enrollment decline would continue, the number of women physicians would continue to increase, the number of FMGs in internal medicine residency training programs would level off, and physician retirement and mortality rates would remain consistent with those in the early 1980s. Since the actual supply estimation model was developed by others, the discussion of the models used was limited.

The results from two different supply models were included in this study. The first assumed that FMGs would represent 16% of total internists. The second assumed there would no FMGs.

Residents and Fellows, Current and Projected

Studies #2 and #3 dealt exclusively with IM residency training programs in the U.S. in the early 1990s. They provide a partial basis for estimating the percentage of IM residents who ultimately became primary care or specialist practitioners. Study #2 was based on data from the NaSIMM which had been collected annually since 1976. It provided historical trend data on the numbers of IM residents from 1976-77 to 1989-90. It also provided an "environmental typology" of IM residency programs as of 1990. Study #3 reported the results of three surveys of residency program directors in the early 1990s designed to learn more about the extent to which third year IM residents continue into subspecialty training versus enter practice as generalists.

Physician Demand/Need/Requirements, Current and Projected

Study #1 provided estimates of the requirements for IM physicians based on an updated version of the GMENAC model used in the late 1970s. Four adjustments were made in the model: population projections were included out to 2020, revised morbidity estimates were used, adjustments in physician productivity were included, and reductions in medical school entrants were made. Several productivity adjustments were made: a reduction was incorporated to reflect the growing proportion of physicians on salary. The productivity of female physicians was set at 80% of that for males, based on a combination of fewer years worked and fewer hours per year.

All of the different scenarios showed an excess of requirements over supply for general IM physicians. All subspecialties except hematology/oncology showed an excess of supply over requirements.

Interface Issues, Current and Projected

None of these studies addressed interface issues in a careful, systematic way. Neither mentioned PAs or NPs, and neither attempted to estimate the extent to which IM generalists and specialists may overlap in their practices.

Comments and Critique

Although study #1 presents useful information and insights, several items of possible interest to policy makers are not presented. It is not possible to determine the extent to which the revised estimates are different from the original GMENAC estimates. The source of some of the adjustments is not made clear in the report. The fact that no mention is made of a new expert panel suggests that all the adjustments to the GMENAC coefficients were made by the Lewin and Associates staff. Of even more importance, most of these adjustments, made almost 10 years after GMENAC and more than 10 years ago, have proven to be incorrect.

NEPHROLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Estimating Workforce and Training Requirements for Nephrologists Through the year 2010. Bethesda, MD: Abt Associates, Inc.1996.	T	T		T		T	T	T	
2. Kletke PR. "The Changing Supply of Renal Physicians". Am J Kidney Dis, 29, 5 (5/97) 781-792.	T	T	T	T	T				
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files									
Practitioner Surveys for Specialty						T	T		
Consensus Groups and Interviews						T			
AMA GME File and/or NaSIMM		T							
NCHS Surveys (NHIS, NAMCS, USRDS, etc.)						T			
Claims Data						T			
Resident/Program Director Surveys									

Overview of Studies

These two studies examined the supply and demand for nephrologists from two different perspectives, incorporating a variety of factors. They reached similar conclusions, i.e., that both the supply of and the demand for nephrologists are likely to increase in the future.

Study #1 devoted more attention to demand than to supply, providing historical data on the incidence of end-stage renal disease (ESDR), organ supply, dialysis rates, mortality due to renal failure, population demographics, and hours worked. Estimates of demand were developed for a variety of assumptions about the incidence of renal disease and involvement of nephrologists in treating ESRD.

Study #2 focused on the supply of nephrologists, and provided projections of the future supply under three alternate scenarios. Only under the restrictions of the 1993 COGME recommendations did the future supply not increase substantially over the next two decades.

NEPHROLOGY

Physician Supply, Current and Projected

Study #1 is a careful and complete study of the current and future supply of nephrologists in the U.S. It built from data in the AMA Physician Master File (which may undercount nephrologists by as much as 20%) , with some additional information on residency training of nephrologists from the National Study of Internal Medicine Manpower (NaSIMM). This study developed estimates of the historical numbers of nephrologists per capita in the U.S. It projected three different scenarios (no change in the production of new nephrologists including a continuation of the growth of IMGs; a continuation of current USMG entry into nephrology without the increase in IMGs; and adoption of the 1993 COGME recommendations). These three scenarios result in increases in the numbers of nephrologists per 100,000 population between 1993 and 2010 of 102%, 74%, and 39%, respectively.

The survey conducted as part of study #1 provided information about practice patterns of nephrologists in the U.S., but the estimate that there were the equivalent of 5,000 nephrologists practicing on a full-time basis was a consensus estimate from the clinical panel convened for this study.

Residents and Fellows, Current and Projected

Neither of these studies examined fellowship training for nephrology. Study #2 did estimate the impact of three different levels of future residency training on the future supply of nephrologists.

Physician Demand/Need/Requirements, Current and Projected

Study #1 examined the need for nephrologists from two perspectives. First , it conducted a survey of over 400 nephrologists in the U.S. to gather data on current practice patterns and patients treated. Second, it analyzed data from the US Renal Data System and HCFA on numbers and patient care times for transplant and dialysis patients. Adjustments were made to some of the estimates based on advice from a panel of experts. Status quo projections were developed that applied the historical incidence rates and treatment patterns to projections of the population. Numerous simulations were conducted to assess the possible impact of a variety of changes in the incidence of renal disease, treatment protocols, and involvement of nephrologists (versus other practitioners).

Study #2 does not attempt to estimate the demand/need for nephrologists, but it does discuss several studies that suggest the need for nephrologists is generally increasing.

Interface Issues, Current and Projected

Both studies mention that specialists other than nephrologists treat ESRD and other renal diseases, and that nephrologists often treat other kinds of patients. However, the analysis of these interface issues was limited.

Comments and Critique

This is a relatively small specialty. As in many specialties, it is difficult to assess the impact of new technologies and procedures on demand, and it is difficult to predict the future burden of disease. Although the incidence of ESRD increases with age, it accounts for only 35% of the effort of nephrologists, and it may account for even less if PAs and NPs are deployed more fully (a point not explored by either study).

NEUROLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Ringel SP. "Neurologists - 1990". Neurology, 41 (12/91) 1863-1866.	T		T		T				
2. Silberberg DH. "2001 and Beyond - What's Ahead for Neurology?". Ann Neuro, 32,6 (12/92) 813-817.	T					T		T	
3. Engstrom JW and Hauser SL. "Future Role of Neurologists". West J Med, 161 (1994) 331-334.								T	
4. Ringel SP. "Future Neurology Workforce: The Right Kind and Number of Neurologists". Neuro, 46 (4/96) 897-900.	T				T			T	
5. Roehrig C and Eisenstein S. "American Academy of Neurology Workforce Task Force Study: Final Report". Ann Arbor, MI: Vector Research, Inc. 1999.	T	T			T	T	T	T	
Data Sources									
AMA and/or AOA Master File	T	T	T		T				
Specialty Association and Board Files	T	T			T				
Practitioner Surveys for Specialty									
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)						T	T	T	
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

Studies #1 through #4 are descriptive studies that summarized a variety of earlier work and provided qualitative insights about the then current status and prospects of neurology. Although none of these studies involved the use of models or quantitative estimates of supply or demand for neurologists, they all helped to define a context for those concerned about neurology and pointed out special considerations and concerns of leaders in the specialty. All four of these studies were calls to arms for the neurology specialty, indicating the importance of promoting the specialty in those years of change in health care organization and financing. A common theme was the important roles of neurologists in the larger health care system.

Study #5 used a very different approach, incorporating some of the latest tools and techniques for analyzing the supply of and demand for neurologists. Rather than simply interpreting a sparse set of available data, this study involved a full-blown modeling effort, complete with original analysis of several national data sets. The general conclusion of the study was that supply and demand for neurologists was in rough balance, confirming an interpretation of several other studies and data sets early in the report. In addition to presenting the results of the national supply and demand analyses, this study included several special studies, including an assessment of the possible impact of universal health insurance, a more detailed assessment of the supply and demand for child neurologists, and the geographic distribution neurologists.

NEUROLOGY

Physician Supply, Current and Projected

Study #5 presented projections of the future neurologist supply through 2020, using the BHPr Physician Supply Model. This model uses AMA Masterfile data as its base and projects future supply using age-specific death rates along with estimates of new annual entrants . The baseline model, which assumes that IMGs will represent 33% of all neurologists by 2020 and that 11% of neurologists will be engaged in non-patient care activities, resulted in a growth in the supply of neurologists from 13,115 in 1998 to 17,495 in 2020. In addition, two other scenarios were presented: the "high scenario" in which the recent increase in IMGs choosing neurology continues, that all will stay in the U.S. to practice, and that there will be no increase in the percentage of non-patient care neurologists; and the "low scenario" which reflects the COGME 50-50-110 proposal.

The baseline model resulted in an increase in FTE neurologists per 100,000 population from 3.68 in 1998 to 3.82 in 2020. The high model resulted in 4.21 FTE neurologists per 100,000 population in 2020, and the low model resulted in a decline to 3.25 per 100,000 population in 2020.

Residents and Fellows, Current and Projected

The low supply scenario estimated the impact of implementing the COGME 50-50-110 recommendation for residency training.

Physician Demand/Need/Requirements, Current and Projected

Studies #1 through #4 discussed a variety of factors related to demand for neurologists, but none of them involved any independent analysis or modeling. The demand projections in study #5 reflect the growth and aging of the population and changes in the uS economy. Demand was projected to grow from 9,949 FTEs in 1998 to 12,953 FTEs in 2020, which tracks the increase in supply quite closely.

The increase in demand for the aging of the population was based on data on outpatient and inpatient "events" per week in different practice settings from AAN files, average time per outpatient and inpatient event from the AMA Socioeconomic Monitoring System, and age-gender specific ambulatory neurology visit counts from NAMCS. The estimates also incorporate factors to reflect the four major insurance settings covering the visits.

Interface Issues, Current and Projected

There is discussion in study #5 of competition of neurologists with other specialists, including primary care physicians, orthopedic surgeons, and physiatrists. The discussion also mentioned the growing number of NPs providing primary care, which the study estimated could result in increased referrals to neurologists.

Comments and Critique

Study #5 provides a thorough analysis of supply of and demand for neurologists. It is one of the few studies to incorporate economic analyses and projections. In addition to describing the basic models and presenting the numerical estimates, this study addresses a number of other relevant issues and considerations. But neurologists see <25% of neurologic visits. Managed care and competition could direct a greater proportion of patients to PCPs. Alternatively, new and more complex treatment modalities could cause the pendulum to swing in the direction of neurologists. To further differentiate themselves, most young neurologists now obtain subspecialty neurology training.

NEUROSURGERY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Menken M. "The Workload of Neurosurgeons: Implications of the 1987 Practice Survey in the USA". J Neurol, Neurosurg & Psych, 54: (1991) 921-924.	T					T			
2. Popp AJ. "Joint Council of State Neurosurgical Societies Task Force on Manpower Training Needs in Neurosurgery Residency Manpower Survey". Albany, NY: Albany Medical College. 1995.			T						
3. Popp AJ and Toselli R. "Work Force Requirements For Neurosurgery". Surg Neurol, 46 (1996) 181-185.							T	T	
4. Harrington TR. "Neurosurgical Manpower Needs - Achieving a Balance". Surg Neurol, 47 (1997) 316-25.	T		T		T		T		
5. Friedlich DL, Feustel PJ, and Popp AJ. "Workforce Demand for Neurosurgeons in the U.S.A.: A Thirteen-Year Retrospective Study". Accepted by J Neurosurg, 1999.									T
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files	T					T			
Practitioner Surveys for Specialty			T		T	T	T		
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys			T					T	

Overview of Studies

This series of studies presents a variety of data and perspectives about the changing supply and demand for neurosurgeons in the U.S. A common theme in all of these was a possible oversupply of neurosurgeons, although the five studies do not come to closure on how to deal with the issue.

Collectively, the studies deal with many of the critical physician workforce issues. Study #1 presented basic data on neurosurgery practice patterns based on a survey of practitioners. Study #2 reported concerns of residency program directors about possible oversupply of neurosurgeons based on a 1995 survey. Study #3 presented a series of ideas and strategies for assessing the requirements for neurosurgery, noting especially the constraints on downsizing. Study #4 summarized the responses to the 1995 JCSNS Manpower Survey, noting among other things that neurosurgeons are underutilized, are more involved with managed care, and are subspecializing at about the same rates as in previous years. Study #5 noted that the numbers of ads for neurosurgeons had increased between 1985 and 1997, but that the increase was not statistically significant.

NEUROSURGERY

Physician Supply, Current and Projected

Study #1, after observing that the number of neurosurgeons had increased significantly in the previous decade, expressed concern that increasing supplies of practitioners inevitably result in "dilution of experience". The study then summarized the responses to the 1987 practice survey of neurosurgeons in the U.S., presenting average counts of procedures performed per practitioner. These data were not linked directly to any study of either supply or demand for neurosurgeons, but the data would be a useful baseline for future comparisons.

Residents and Fellows, Current and Projected

Study #2 presented the results of a survey of all neurosurgery residency programs in the U.S. designed to gather basic data on each program, insights about the possible effects that changes in manpower might have on the training programs, and to obtain opinions of program directors about diverse issues affecting manpower. In general, the program directors expressed concern that there were too many neurosurgeons and that too many neurosurgeons were being trained.

Physician Demand/Need/Requirements, Current and Projected

The survey summarized in study #4 presented a variety of information relevant to requirements for neurosurgeons. Of particular significance is the large volume of extracranial surgery performed; e.g., for 50% of neurosurgeons, lumbar spine procedures accounted for >50% of operations. While most neurosurgeons could perform more procedures/wk, 86% were unwilling to take more trauma call. The study concluded that the neurosurgery specialty was facing a serious dilemma. A reduction in training programs would help to reduce the number of practitioners which would help to increase the average numbers of procedures per neurosurgeon. Such a reduction would also create "risks of so limiting our numbers and expertise that indeed we [might] become so niche oriented that we cannot change in these changing times". The author did not resolve this conflict in his article, nor did the survey respondents.

Study #5 examined recruiting ads for neurosurgeons in the *Journal of Neurosurgery* and *Neurosurgery* for selected months and years between 1985-86 and 1997-98. They counted each ad only once and distinguished between academic and private practice venues. They concluded that, although the numbers of ads increased over the study period, the increase was not statistically significant.

Interface Issues, Current and Projected

Aside from a few general comments about competition with other specialties, none of these studies examined interface issues with either other physician specialists or non-physician clinicians.

Comments and Critique

These studies point to the extensive overlap of neurosurgeons with orthopedic surgeons and the displacement of diagnostic procedures by radiologists. The minority of their time is spent on intracranial surgery--less than 10% of their professional time. Given the strong overlap of other specialties and the small number of neurosurgeons within the pool of physicians with whom they share responsibility, workforce projections based on the volume of work performed by neurosurgeons are impossible.

These surveys help to determine how busy neurosurgeons are within various demographic settings. There is some basic and measurable need for neurosurgeons in a community even though a small amount of their time may be spent on things uniquely neurosurgical. That need can probably be defined better in terms of geographic distance, population size and the organization of their practices (critical mass of neurosurgeons, PAs, others). They remain busy doing a variety of things, but it is not only their workload that defines the need for them in a community.

NUCLEAR MEDICINE

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Clouse JC, Rogers M, Carretta RF, et al. "Future Nuclear Medicine Physician Requirements". J Nucl Med, 37, 5 (1996) 14N-18N.	T					T			
2. Clouse JC, Rogers M, et al. "Benchmarking U.S. Nuclear Medicine Physician Workforce Requirements Based on Managed Care Organization Effects". J Nucl Med, 39,7 (7/98) 11N ff.							T	T	
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files									
Practitioner Surveys for Specialty	T					T	T	T	
Consensus Groups and Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Studies

These studies provide some basic information about the nuclear medicine specialty. Although the studies shed some light on the specialty, the situation cannot be totally revealed by these kinds of studies. This is due to the fact that nuclear medicine is both a specialty and a service. Only a small proportion of nuclear medicine is provided by specialists in the discipline of Nuclear Medicine.

Study #1summarized the size and characteristics of the NM workforce. The survey included responses by nuclear medicine physicians, radiologists, and other specialists who reported performing specific ICD-9 nuclear medicine procedures.

Study #2 provides estimates of the numbers of nuclear medicine specialists on staff in a number of different HMO environments in the U.S., with comparisons of national averages. The HMO figures were significantly less than the national averages.

NUCLEAR MEDICINE

Physician Supply, Current and Projected

Study #1 described the supply of nuclear medicine specialists in the U.S. in 1992 based on responses to a survey conducted by the Society of Nuclear Medicine. The survey was sent to all physicians, scientists, and technologists involved in nuclear medicine in any setting. The survey revealed that 2/3 of the more than 10,000 physicians who practice nuclear medicine do so less than 20% of the time. Most nuclear medicine physicians were radiologists, who also practiced nuclear medicine less than 20% of the time. Even nuclear medicine specialists, who represented less than 1/3 of the survey respondents, devoted only 60% of their time to the specialty. The study estimated that there were 2,494 FTE nuclear medicine physicians in 1992 (3,243 if the data are corrected for the 80% response rate).

Study #2 estimated that there were 1.7 nuclear medicine physicians per 100,000 population in the U.S., but no description is provided of the source of this estimate.

Residents and Fellows, Current and Projected

Little was said in either of these studies about residency training or Board Certification for NM specialists.

Physician Demand/Need/Requirements, Current and Projected

The benchmarking study (#2) is actually a requirements study. It presented estimates of the numbers of FTE nuclear medicine physicians that would be needed in the U.S. assuming that services were delivered with staffing like that of HMOs. Estimates are provided for several "benchmark scenarios" of the substitution of radiologists for NM physicians. The resulting estimates of need for NM specialists range from 1,066 to 3,196. No effort was made to estimate requirements for provider arrangement other than 100% HMO. The study noted that, although the location of NM services was changing, "nuclear medicine procedure volumes were reported as generally stable".

The article noted that there are several "factors for uncertainty" in all this. The most important of these factors is probably the multiple specialties proving NM services.

Interface Issues, Current and Projected

Study #2 acknowledged that many nuclear medicine services were provided by radiologists, and made an effort to estimate the extent to which different "conversion rates" of radiologists to nuclear medicine.

Comments and Critique

These studies provide useful insights about the nuclear medicine workforce. Perhaps the biggest problem in understanding NM is that it is a both a service and specialty. Because less than 1/3 of NM services are delivered by NM specialists, it is difficult to plan for a NM workforce.

The projections in these studies assumed that 100% of NM services would be delivered in an HMO/MCO environment. Although this is an interesting scenario to examine, this may not be a realistic scenario on which to base specialty plans and policies. Fee-for-service (or open managed care systems that mimic it) is not likely to disappear, and other financing/payment plans will also remain.

OBSTETRICS & GYNECOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Jacoby I, Meyer GS, Haffner W, Cheng E, Potter AL, and Pearse WH. "Workforce Analysis in Obstetrics and Gynecology". Uniformed Services University of the Health Sciences. 1997	T	T	T	T	T	T			
2. Jacoby I, Meyer GS, Haffner W, Cheng E, Potter AL, and Pearse WH. "Modeling the Future Workforce of Obstetrics and Gynecology". Ob Gyn, 92 (9/98) 450-456.	T	T	T	T	T	T			
Data Sources									
AMA and/or AOA Master File	T	T			T	T			
Specialty Association and Board Files			T	T					
Practitioner Surveys for Specialty									
Consensus Groups and Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NNS, NAMCS, etc.)						T	T		
Claims Data						T	T		
Resident/Program Director Surveys									

Overview of Studies

These studies summarize a variety of data and analyses that reveal important insights about the ob-gyn workforce in the U.S. The studies provide data on current and projected supply of ob-gyns, profiles of obstetric and gynecologic care, and the geographic distribution of general and specialist ob-gyns. Study #2 builds on the findings of study #1, focusing on strategic issues facing the ob-gyn specialty.

Study #1 observed that the female population in the U.S. will grow approximately 17% over the next 25 years, with even larger increases in the numbers of older women. Observing that "the expertise and experience of ob-gyns make them a natural to become major providers to the large and rapidly growing older female population", the authors suggest that "ob-gyn training programs would require a further redesign of their curricula to emphasize generalist services". The study also call for future research on such topics as gender-specific productivity, death, and retirement rates; past ob-gyn care for female patients, and the development of "innovative scenarios for the future of the specialty".

Study #2 concluded that "ob-gyns must resolve whether to provide more generalist office-based care, especially to the rapidly growing older female population, or to invest more intensively in surgical specialty care. The specialty's unique contribution to women's health should influence this decision."

OBSTETRICS & GYNECOLOGY

Physician Supply, Current and Projected

Study #1 summarized a variety of data on the numbers and characteristics of ob-gyns, along with projections out to 2020. Data from the NAMCS and the AMA SMS revealed that the majority of deliveries, uterine and cervical cancer services, gynecologic surgeries, genital prolapse, laparoscopy, contraceptive services, and menopausal services were handled by ob-gyns. These sources also revealed that ob-gyns also provided significant numbers of medical exams. Procedures/diagnoses involving urinary tract problems, vaccinations, and pap smears were more likely to be handled by generalists or other specialists.

Supply projections were developed using a age cohort flow model which started from actual numbers of ob-gyns in 1997, with numbers of new ob-gyns from ACOG residency statistics and deaths and retirements from BHPr. In addition to baseline projections, the model was used to simulate the impact of reductions in the numbers of new ob-gyn residents. The models showed that the number of ob-gyns per 100,000 population would grow slightly over the next 20 years. The supply ratios were approximately 30% higher than those in an MCO as reported by Wennberg.

Residents and Fellows, Current and Projected

Neither study explicitly examined ob-gyn residency training programs, although study #1 did examine the impact of altering the percentage of resident that were female on the percentage of practitioners who were female.

Physician Demand/Need/Requirements, Current and Projected

Study #1 provided a variety of data related to the demand and need for ob-gyn services from NAMCS and the AMA SMS. Although the study did not develop actual projections of future demand/need, it did present estimates of the growth of the female population in the U.S. which was the basis for suggestions that the demand/need for ob-gyn services would increase in the future. The study concluded that the major opportunities for expansion of ob-gyn were related to providing better services for older women and providing more generalist services to younger women. Both would require redesign of residency training programs.

Interface Issues, Current and Projected

The roles of generalist and other specialist physicians in providing ob-gyn services are presented in study #1. Data are also presented in study #1 on the numbers of deliveries by nurse midwives, but the study does not address the possible impact of the current growth in the numbers of nurse midwives on the future demand for ob-gyn physicians.

Comments and Critique

These studies reveal an understanding of the critical factors that affect the supply of and demand for ob-gyns and the broader context of ob-gyn workforce policy. They show the diversity of providers who care for women and the fragmented nature of care to a growing population of older women.

The workforce model used is straight forward, but it does not factor in the percent effort, which will be of increasing importance because of the growing number of female physicians. The interface with midwives deserves more attention, since the numbers of these professionals is growing.

ONCOLOGY

DRAFT 9/20/99

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. American Society of Clinical Oncology. "Status of the Medical Oncology Workforce". J Clin Oncol, 14, 9 (9/96) 2612-2621.	T								
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files	T								
Practitioner Surveys for Specialty	T								
Consensus Groups and Interviews	T								
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Study

This study summarizes the responses to a survey of 4,239 members of the American Society of Clinical Oncology (ASCO). The objective of the survey, which was stimulated in part by the 110/50-50 recommendations of COGME, was to "determine accurately the number of full-time equivalent medical oncologists in the U.S., to determine how medical oncologists in different work settings divide their professional activities, and to determine whether medical oncology represents a primary care specialty in the minds of practicing oncologists."

The study concluded that the "medical oncology community devotes the majority of its time to providing oncologic patient care and does not provide or appear to wish to provide what the public defines as primary care. The survey estimate of 1.8 medical oncologists per 100,000 adult Americans is in close accord with HMO estimates of the number of desired oncologists. There does not appear to be an oversupply of medical oncologists in the U.S."

ONCOLOGY

Physician Supply, Current and Projected

The survey discussed in this study, which had an 82% response rate, provided a variety of basic demographic and practice characteristics of oncologists, and also summarized a number of questions about possible satisfaction with possible changes in the respondents' practices. The responses showed that oncologists are predominantly male (87%), white (87%), in private practice (65%), in patients care (82%), and specializing in medical oncology (70%).

The average numbers of patients seen in the past 30 days varied somewhat by specialty. Oncology-hematology physicians saw 197 patients, medical oncology physicians saw 176, hematology physicians saw 118, and other saw 98.

The survey also showed that, although many oncologists did deliver primary care services of one sort or another, most did not.

Responses to a set of questions about whether respondents would be more or less satisfied providing more oncology services or more primary care services revealed that, on the whole, they would prefer to provide more emphasis on specialty services and less on primary care.

Residents and Fellows, Current and Projected

This study did not examine oncology residency training programs.

Physician Demand/Need/Requirements, Current and Projected

This study did not address questions related to the demand for oncologists.

Interface Issues, Current and Projected

Although the survey asked oncologists whether they were interested in performing more primary care services, it did not ask whether other specialists were competing for oncology services.

Comments and Critique

This study achieved its stated purposes effectively, but its limited scope reduced the utility of the findings.

The study provided no indication of whether the supply of oncologists is growing or shrinking.

OPHTHALMOLOGY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Lee PP, Jackson CA, and Relles DA. "Estimating Eye Care Provider Supply and Workforce Requirements". Santa Monica, CA: RAND. 1995.	T	T	T		T	T	T	T	
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files	T	T	T		T		T	T	
Practitioner Surveys for Specialty	T					T	T		
Consensus Groups and Interviews									
AMA GME File and NRMP	T	T							
NCHS Surveys (NHIS, NAMCS, etc.)						T	T	T	
Claims Data						T	T	T	
Resident/Program Director Surveys									

Overview of Study

This was a major study of eye care providers in the U.S. It used three different models to assess the balance between workforce supply and requirements for eye care: a model of the supply of eye care providers, a model of the public health need for eye care, and a model of the current demand for or utilization of eye care services. The three models were organized to encompass those eye care services traditional to ophthalmic care patterns, organized into four domains of care: preventive, low vision/rehabilitation, elective, and problem-oriented.

The results of the analysis and models showed "a large surplus of eye care providers in the U.S. [under almost all of the scenarios of delivery]. However, the characteristics of the surplus vary according to the health care delivery system posited."

OPHTHALMOLOGY

Physician Supply, Current and Projected

The supply estimation models focused on ophthalmologists and optometrists. Estimates were also included for other physicians, but for the projections these estimates were continued at then current levels.

The base data for the supply estimates for ophthalmologists came from the AAO membership file which contains data on members and nonmembers. Comparisons were made with Census Bureau data which was found to be quantitatively similar. Because the AOA did not cooperate with this study, supply estimates for optometrists were obtained from Census Bureau files. Downward adjustments were made for residents (0.5 FTE), and women (0.85 FTE), and academic ophthalmologists (0.5 FTE).

Projections were developed out to 2010 using an annual age-cohort flow model, with additions coming from residency graduations, and deaths/retirements coming from BHPr estimates.

Residents and Fellows, Current and Projected

Aside from incorporating estimates of the numbers of new practitioners that will enter ophthalmology in the future, this study does not devote attention to residency training.

Physician Demand/Need/Requirements, Current and Projected

After identifying and collapsing the thousands of procedure codes related to vision care into 93 condition groups and separating these into medical and surgical components, estimates were developed of the time required for each condition under the need and demand models. Work-time minutes were then estimated for each condition for subsequent translation into estimates of FTE practitioners. Demand estimates were based on current levels of service from NAMCS and NHDS. Need estimates were based on recommended Preferred Practice Pattern and National Eye Care Forum schedules. Adjustments were made in the estimates for the elderly based on data from Medicare Part B files. Other adjustments were made for patients with multiple conditions.

When translating the demand/need for service into ophthalmologists or optometrists, three different "reconciliation models" were used: the optometrist-first model, the ophthalmologist first model, and the primary care provider model. These three delivery system scenarios provide a range of options in which care is provided. These scenarios yielded very different need estimates for ophthalmologists.

Interface Issues, Current and Projected

This study examined relationships between ophthalmologists, optometrists, and other physicians. Because the AOA (optometrists) declined to participate in the study, it lacked some data that would have been useful .

Comments and Critique

This study builds from detailed counts of specific procedures with time assigned to each. The model is highly dependent on time calculations---both the time to accomplish care and procedures and the time that individuals devote to providing care. However, it is difficult to define the details of time for the various medical and surgical procedures as actually performed under various practice conditions and to define the associated time devoted to clinical activities not directly related to billable procedures. Despite these concerns, the error of this method was estimated to be +5%. Applying this methodology to the existing demand for eye care providers indicated that there was a 45% surplus in 1994.

ORTHOPEDIC SURGERY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Lee PL, Jackson CA, and Relles DA. Demand-Based Assessment of Workforce Requirements for Orthopedic Services. J of Bone Joint Surg, 80-A (3/98) 313-26.	T	T	T	T		T	T	T	T
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files	T					T	T		
Practitioner Surveys for Specialty	T						T		
Consensus Groups and Interviews									
AMA GME File and NRMP			T						
NCHS Surveys (NHIS, NAMCS, etc.)						T	T	T	
GMENAC						T			
Resident/Program Director Surveys									

Overview of Study

This study describes a set of models used to measure the current supply and demand for orthopedic surgeons in the U.S., with projections to 2010. Building on a variety of data sources, including a new survey of practicing orthopedic surgeons, the authors from RAND assessed the adequacy of the current and future supply of Orhopedic Surgeons. This is one of the most comprehensive studies of a medical specialty conducted in recent years, although it does not incorporate geographic variations. The authors describe the many limitations and advantages of their comprehensive approach.

As part of the process of developing the models, a series of ratios and assumptions were developed that estimate the time required for different orthopedic procedures, the incidence of different procedures in the population, and the impact of demographic trends on future demand for services. These ratios are incorporated into estimates of the demand for orthopedic surgeons in the U.S., assuming that a full-time practitioner works 2200 hours per year.

The models in this study included both medical and operative components of care for 9 key anatomical locations. This and other elements of the models developed in this study permit a number of questions to be addressed that are beyond the reach of simpler models.

The study projected a supply of 7.5 orthopedic surgeons in 2010, compared with an estimated "demand-based requirement" of 6.0. This projected surplus of 20% is the same as the degree of surplus calculated by this methodology for 1994, the year that the study was performed.

ORTHOPEDIC SURGERY

Physician Supply, Current and Projected

Baseline estimates of the supply of Orthopedic Surgeons were developed from the AMA Master File, supplemented by data from AAOS. Data from NRMP were the basis for future additions to the supply. A basic age-cohort flow model was used to project the future supply of specialists, which was found to be 0.4 per 100,000 larger in 2010 than in 1995. Alternate projections were also made assuming that residency programs would be halved. Assessments were made of the impact of the increased emphasis on managed care. The contributions of residents to the supply of services were estimated using the results of "previous workforce studies". The patient care contributions ranged from 0.35 FTE for PGY1 residents to 1.0 FTE for PGY5 residents. Women were assigned an FTE rate of 0.85, based on a 1989 study. Both MD orthopedists and DO orthopedists were included in the study with no other differentiation.

Residents and Fellows, Current and Projected

This study devoted little attention to residency training. The model for projecting future numbers of orthopedic surgeons used data on residents from the NRMP. Most of the projections assumed that the numbers of new entrants would remain constant at 602. This level of production increased the numbers of orthopedic surgeons from about 18,500 in 1995 to about 21,100 in 2010.

A model was also developed in which the production of new orthopedic surgeons was cut in half. This resulted in a reduction in the number of practitioners in 2010 to about 17,000. This model represented the magnitude of cuts in residents required to eliminate the projected surplus.

Physician Demand/Need/Requirements, Current and Projected

The demand models converted utilization data and estimated times required for services into estimates of total orthopedic surgeon time required. These estimates were translated into FTE estimates assuming 2200 hours per FTE. Estimates were also developed of the impact of using "practice assistants" (either physicians or non-physician clinicians).

The demand estimation process involved several steps. First was an analysis of several national data sets that had information on age- and gender-specific utilization rates of orthopedic procedures. Second was the creation of a data set from the NAMCS and similar files that contained ICD-9 codes for all orthopedic procedures. Third, these codes were grouped according to a typology of anatomical locations and assigned to one anatomical location. Next the location-condition data were translated into work times based on the NAMCS data, with corroboration from a stratified sample of 1525 orthopedic surgeons. Finally, FTE estimates were developed assuming 2200 hours per FTE. Adjustments were made for multiple medical conditions.

Interface Issues, Current and Projected

The time required for orthopedic services reflected the percent of services provided by orthopedic surgeons. Although "practice assistants" were mentioned, nonphysician clinicians were mentioned only in passing.

Comments and Critique

This is a highly quantitative methodology that depends on the accuracy of the quantitative factors used (e.g., time per encounter; hours per FTE orthopedic surgeon, etc.) and on the completeness in capturing all patient encounters from the data sources used (NAMCS,etc.). Based on these quantitative estimates, the study found that there was a 20% surplus of orthopedic surgeons in 1994. In projecting demand, no consideration was given to changes in technology or to the roles of other physician specialties and NPCs in providing the services that are provided by orthopedic surgeons. Like many other studies performed in the early 1990s, the projections used US population figures that were too low.

OTOLARYNGOLOGY and HEAD and NECK SURGERY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Miller RH. Otolaryngology Manpower in the Year 2010. Laryngoscope, 103 (1993) 750-753.	T		T						
2. Jafek BW, Slenkovich N, and Sheikali S. Physician Workforce in Otolaryngology. Otolaryngol Head Neck Surg, 115 (1996) 306-311.	T								
3. Anderson GF, Han KC, Miller RH, and Johns ME. A Comparison of Three Methods for Estimating Requirements Medical Specialties. Health Serv Res, 32 (1997) 139-153.			T				T		
4. Close LG and Miller RH. Head and Neck Surgery Workforce in the Year 2014. Laryngoscope, 105 (10/95) 1081-1085.	T				T				
5 Jacoby I. A Unified Approach to Physician Workforce Estimated: A Case of Otolaryngologists. AHSR, 1999	T	T			T	T			
Data Sources									
AMA and/or AOA Master File	T		T		T				
Specialty Association and Board Files	T		T		T		T		
Practitioner Surveys for Specialty	T								
Consensus Groups and Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)						T			
Claims Data						T			
Resident/Program Director Surveys									

Overview of Studies

Collectively, these studies examine historical trends in the supply of otolaryngologists in the U.S., project the future supply of otolaryngologists and assess the adequacy of the future supply.

The estimated numbers of otolaryngologists for 1995 in studies #1 and #2 are different by over 1,000 (14%). (AAO-HNS numbers are larger than the AMA numbers.) Nationally, the projected growth of otolaryngologists is slightly lower than the projected population growth, with specialists per 100,000 decreasing from 2.73 in 1995 to 2.67 in 2010 (1.3%), despite projected growth in the number of otolaryngologists of 10.7% between 1995 and 2010 (in study #1). There are wide variations in population per otolaryngologist across the 50 states.

The models show an overall shortage of otolaryngologists in 1994. The projections show little change for otolaryngologists by 2010, reflecting flat demand and supply growing at about the rate of growth of the population.

OTOLARYNGOLOGY and HEAD AND NECK SURGERY

Physician Supply, Current and Projected

Supply projections were developed from an age-cohort flow model, using 5-year age groupings. The models, which use data from the AMA and the American College of Surgeons Longitudinal Study, showed an increasing supply out to 2010 and beyond. The definition of "head and neck surgeons" used in study #4 is very narrow, and represents only about 15% of otolaryngologists.

Study #2 examined the historical supply of otolaryngologists in states and regions of the country. This analysis showed a 23% decline in *population per otolaryngologist,* from 44,082 in 1972 to 32,173 in 1995, with significant variations across states.

Among the assumptions used in the supply models are that: the number of new otolaryngologists will not change in the future; 25% of physicians will retire at age 65 and remainder at 70. No attempt was made to incorporate or reflect the increasing number of women in the specialty.

Residents and Fellows, Current and Projected

Study #2 incorporated data on residency training programs from the American College Surgeons study of residents. Study #4 also used historical estimates of the number of residents entering practice from specialty board files. The projections assumed a simple continuation of historical patterns of residency training in the specialty.

Physician Demand/Need/Requirements, Current and Projected

Study #3 compared three methods for estimating the requirements of Otolaryngologists: managed care staffing estimates, the BHPr demand model and a modified adjusted-needs model. The managed care estimates were based on 1994 data from the three largest staff-model HMOs. The BHPr demand model considered encounters by otolaryngologists based on age-, gender-, and race-ethnic-specific utilization. The adjusted-needs assessment considered a variety of factors similar to those used by GMENAC, including incidence rates, physician visit rates, procedures performed by otolaryngologists, and physician productivity estimates. There was significant variation in the estimates derived from the three techniques. The estimates were very sensitive to the assumptions used in the models.

Study #4 mentioned a decline in some head and neck cancer cases.

Study #5 relied on NCHS and claims data to assess the current provision of services by otolaryngologists.

Interface Issues, Current and Projected

Study #4 mentions other specialties briefly, but does not attempt to incorporate them into the analyses. There is no mention of nonphysician clinicians in any of the studies.

Comments and Critique

These studies present a variety of useful data and insights about otolaryngology and head & neck surgery in the US. However, they do have some limitations. For example, there were no estimates of possible encroachment of other specialties (e.g., plastic surgeons, oral surgeons, generalists). There were no geographic distinctions. Supply projections did not consider possible changes in the numbers of residents training in Otolaryngology. No effort was made to examine the impact of changes in such factors as new technologies and treatments that could affect otolaryngology. Nonetheless, although they are independent studies, together they provide important insights about the specialty.

PATHOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Vance RP, Prichard RW, and Smith RD. "Pathology Trainee Manpower: APC Program Directors' Questionnaire, 1989 Results". Human Path, 22 (1991) 1067-1076.			T						T
2. Vance RP. "Pathology Manpower: Needs in the Year 2000: The View from 1990". Lab Med, 23,6 (6/92) 412-415.	T		T						
3. Vance RP, Hartmann WH, and Prichard RW. "Pathology Trainee Manpower: Historical Perspectives". Arch Pathol Lab Med, 116 (6/92) 574-577.			T						
4. Vance RP. "Problems and Opportunities in Pathology Manpower". Arch Pathol Lab Med, 116 (6/92) 593-598.	T		T	T					
5. Vance RP, Prichard RW, and Smith RD. "Update on Pathology Trainees: Recruitment, Attrition, and Impact on Practice". Am J Clin Path, 100 (10/93) S37-S40.			T						
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files	T								
Practitioner Surveys for Specialty									
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP			T	T					
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys			T						T

Overview of Studies

All of these studies were initiated because of concerns about the declining numbers of new pathology residents over the past decade or more. The concerns about this decline increased when the COGME recommendations were released in 1993 that called for reductions in residency programs for non-primary care specialties.

The studies do not really estimate supply and demand for pathologists, but they do present interesting information about the pathology and related specialties. They also provide insights related to data collection and data accuracy for physician workforce studies. All of the studies deal at least peripherally with residency training programs in pathology.

PATHOLOGY

Physician Supply, Current and Projected

Studies #2 and #4 provide rudimentary data on historical supply of pathologists in the U.S., but with no projections. The other studies provide no data on supply.

Residents and Fellows, Current and Projected

Study #3 presents a long-term history of pathology residency programs in the U.S., showing the growth from the 1920s to the early 1970s, and the fluctuations since then. The number of programs declined from nearly 800 in 1964 to less than 300 in the late 1980s, with a smaller decline in the number of residents. The study also reported changes in a variety of demographic and other characteristics of GME trainees.

Studies #1 and #5 summarize the responses to the 1989 and 1992 APC surveys of pathology residency program directors, respectively. They provide a variety of demographic, retention, recruiting, and graduation statistics for residents in samples of programs across the country.

Physician Demand/Need/Requirements, Current and Projected

Although study #2 mentions pathology manpower needs in its title, the primary focus of this study is recruiting into pathology residency programs. The same is true for study #4.

Interface Issues, Current and Projected

Although the studies do talk in broad terms about competition for new physicians in residency programs, there is no discussion of competition or substitution in the workplace.

Comments and Critique

These studies generally fulfill their stated objectives of providing historical information about pathology residency training programs. However, they do not provide a basis for assessing the extent to which supply of and demand for pathologists are in or out of balance.

PEDIATRICS

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. AAP Committee on Careers and Opportunities. "Committee Report: Population-to-Pediatrician Ratio Estimates: A Subject Review". Pediatrics, 97, 4 (4/96) 597-600.							T		
2. Chang R-KR and Halfon N. "Geographic Distribution of Pediatricians in the United States: An Analysis of the Fifty States and Washington, DC". Pediatrics, 100 (1997) 172-79.	T				T				
3. American Academy of Pediatrics Committee on Pediatric Workforce. "Pediatric Workforce Statement". Pediatrics, 102, 2 (8/98) 418-427.	T		T		T	T			T
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files	T				T		T		
Practitioner Surveys for Specialty									
Consensus Groups and Interviews									
AMA GME File and/or NRMP	T		T		T				
NCHS Surveys (NHIS, NAMCS, etc.)						T	T		
Claims Data									
Resident/Program Director Surveys			T						T

Overview of Studies

These three studies examined current and historical supply and demand for pediatricians in the U.S. Together they provide insights about many aspects of the pediatric workforce.

Study #1 examined the demand for pediatricians and discusses as measured by population-to-pediatrician ratio. It also discusses a variety of factors that may influence the pediatric workforce.

Study #2 focused on the geographic distribution of pediatricians across the U.S. It revealed that between 1982 and 1992 the number of pediatricians per 100,000 children grew from 35.1 to 48.6 (39%). The increase varied from 4% in Wyoming to 63% in Massachusetts.

Study #3 is a Pediatric Workforce [Policy] Statement that reviews current projections [of the demand for pediatricians] and identifies factors expected to have the most impact on the pediatric workforce.

PEDIATRICS

Physician Supply, Current and Projected

Studies #2 and #3 present a variety of data and insights about the historical supply of pediatricians. Study #2 focused on the geographic distribution of pediatricians across the U.S. It revealed that between 1982 and 1992 the number of pediatricians per 100,000 children grew from 35.1 to 48.6 (39%). Pediatricians tended to concentrate in states with high per capita income and in states with larger numbers of residency training positions.

Study #3 summarized the findings of several earlier studies, providing selected information about professional activities and demographic characteristics. The authors cited unpublished data from the AAP that female pediatricians in direct patient care work 82.8% as many hours per week (46.1 vs 56.1) and see 76.5% as many patients (82.9 vs 108.4 per week) as male pediatricians.

Residents and Fellows, Current and Projected

Study #3 observed that interest in pediatrics had increased in the 1980s as demonstrated by an increasing proportion of residents selecting pediatrics. They also observed that 64% of pediatric residents in 1997 were women and 24% were IMGs.

Physician Demand/Need/Requirements, Current and Projected

Study #1 reviewed several methods used to estimate demand for pediatricians, as measured using staffing ratios of children to FTE pediatricians. The study began with a brief discussion of the 1990 GMENAC estimate (2033 children per FTE pediatrician), the 1990 Abt Associates estimate (2430:1), and staffing ratios from a midwestern HMO. The study also described two different methods for evaluating an area's demand for a pediatrician. The model of Hicks and Glenn, which focuses on providers considering entering a market, estimates the population needed to support a pediatrician based on office visits per week, weeks worked per year, and visits per child per year. The model of Miller and Associates, which is designed to assist pediatricians and community leaders in estimating primary care needs of patients, constructs estimates of physician visits based on annual patient visit rates and visits per pediatrician per year, with adjustments for numbers of general and family physicians.

Interface Issues, Current and Projected

These studies report that 15-20% of the services to children are provided by FP/GPs. Pediatric sub-specialists provide another 15-20% of pediatric primary care. Study #3 also discussed the increasing roles of NPs and PAs in providing pediatric services.

Comments and Critique

These studies point out the difficulties in estimating the need for pediatricians. On the demand side there are uncertainties about birth rate, the critical factor in determining demand. On the supply side, pediatricians provide only 65% of the general pediatric care provided by physicians (FP/GPs and subspecialty pediatricians provide the rest), and pediatricians provide less than 65% of the care when NPs and PAs are considered. The increasing numbers of these nonphysician clinicians could significantly impact on need for pediatricians in the future. Measuring that impact will be important. The analysis of the contribution of women pediatricians (approx. 80% effort) is another important factor for the future.

PHYSICAL MEDICINE & REHABILITATION

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Hogan PF, Dobson A, and Haynie B. Physical Medicine and Rehabilitation Workforce Study, The Supply and Demand for Physiatrists. Chicago, IL: AAPMR. 1995.	T	T	T		T		T	T	
Data Sources									
AMA and/or AOA Master File	T	T			T		T	T	
Specialty Association and Board Files		T	T						
Practitioner Surveys for Specialty									
Consensus Groups and Interviews					T			T	
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data						T			
Resident/Program Director Surveys									

Overview of Study

This study was originally done in 1992 and updated in 1995. It presents two models, both of which are built on the assumption that “demand” can be inferred from the career decisions made by physiatrists; i.e., they go to where the demand exists. By assessing where physiatrists went in the years 1985-1992, and by determining the factors (competition, HMOs, etc.) operative in those locales,this model assumes that it is possible to predict how opportunities for physiatrists (i.e., demand) will be affected in the future and, therefore, what the demand will be. Factors that decrease opportunities for physiatrists include neurologists, anesthesiologists, HMOs and (in one model) physical therapists. Demand is less in the south, mountain and Pacific regions. Conversely, factors that increase opportunities for physiatrists include orthopedic surgeons, patients >65 yrs old and (as in the other model) physical therapists. The models address market conditions as currently operative, market conditions as perceived and urban-rural differences. Future demand is the product of these various modifiers.

PHYSICAL MEDICINE & REHABILITATION

Physician Supply, Current and Projected

Starting with a 1994-95 baseline year, the supply of physiatrists was projected out to 2015 using an age cohort flow model. The "default" projections assumed that residency program production would remain constant over the projection period. The separation rates are from a Vector Research Inc study done for BHPr. In addition to the "default" projections, one scenario is presented that represents adjusting the GME production rate so that the output equals that of the demand model estimates. In addition to providing aggregate figures for the entire U.S., the study presented state-level estimates of "excess supply". The default projections showed an increase in the number of physiatrists from 4774 in 1994 to 9724 in 2015, an increase of more than 100%.

Residents and Fellows, Current and Projected

Although one of the scenarios examined in the study involved a reduction of new physiatrists of 60%, residency training programs were not actively examined in this study.

Physician Demand/Need/Requirements, Current and Projected

The estimation of demand was the largest part of this study, with nine different scenarios included. The key differences among the nine scenarios were the demand starting point (3 different options) and changes in market conditions. Among the factors that can be varied in the model were: managed care penetration, the supply of competing providers, the incidence of diseases and conditions, and factors that affect demand, such as technology. Two different methods were used to estimate the key behavioral parameters of the demand model. Empirical methods involve the use of actual data as the basis for estimating demand. Consensus methods were also used, drawing on a diverse expert panel of eight physiatrists.

The demand based model used in this study involved the use of regression models to relate changes in the numbers of physiatrists in counties in the U.S. between 1985 and 1992, with a variety of factors believed to be related to demand for their services. The independent factors included: total population in 1985, change in total population, change in HMO penetration, number of MDs in 1985, change in MDs, number of neurologists in 1985, change in the numbers of neurologists, number of orthopedists in 1985, change in the number of orthopedists, population over 85, change in population over 85, population between 65 and 85, change in population between 65 and 85, number of physical therapists in 1985, change in physical therapists, region in country, and per capita income in 1985.

Interface Issues, Current and Projected

The "encroachment" of neurologists into the practice arena of PM&R was explicitly included in two of the eleven scenarios examined in this study.

Comments and Critique

Future demand is derived from an extrapolation of the current patterns of distribution of physiatrists. This distribution is assumed to be the product of a limited number of modifiers (competition, age of population, etc.). The weight of these modifiers was derived from the pattern of distribution of physiatrists in the past. All of this information and extrapolation is elevated to a highly mathematical level, with adjustment factors, standard errors, etc., as though there is a reality to what was measured.

But there is no consideration of other factors that may lead physicians to choose a practice site or that may lead students to become psyiatrists (e.g., technology, economics, life style). Moreover, there is no explanation for the vast differences in the distribution of physiatrists (5-fold among medium-sized cities of comparable size).

PLASTIC SURGERY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Wiggins VL, Camp MD, and Peterson GL. "Executive Report: ASPRS Plastic Surgery Market and Workforce Study". 1994.	T	T	T		T	T	T		
Data Sources									
AMA and/or AOA Master File	T				T				
Specialty Association and Board Files	T	T	T			T	T	T	
Practitioner Surveys for Specialty									
Consensus Groups and Interviews									
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
BEA, BLS Data							T	T	
Resident/Program Director Surveys									

Overview of Study

This study takes the conventional approach to estimating the size of plastic surgery workforce to the year 2040, based on the number currently in practice and various input rates of residents. However, its approach to demand is unique. It defines the future need for plastic surgeons in terms of the practice opportunities that will exist within 183 Economic Areas defined by Bureau of Economic Analysis. Using data from the Bureau of Labor Statistics and Bureau of the Census, it projects the future regional economic and population characteristics of each Economic Area to the year 2040, and, based on these characteristics, projects the volume of demand in 2040 for the services of the kind delivered in 1990 by specialists who have the characteristics of 1990 specialists. It then predicts the future geographic distribution and density of plastic surgeons by predicting where graduating residents will go, based on historic patterns that relate to proximity to teaching hospital, choice of urban setting and potential income. Potential income is derived from an analysis of the future volume of service in each Economic Area and the density of competing plastic surgeons and other surgeons in the Area.

The basic conclusion is that, unless there are reductions in the production of new plastic surgeons, the supply will grow faster than the demand for two or more decades. This will reduce the income possibilities of plastic surgeons in the future.

PLASTIC SURGERY

Physician Supply, Current and Projected

The supply projections build on baseline estimates of 4,196 plastic surgeons in the U.S. in 1993. The projections were developed using an age cohort flow model. The death and retirement estimates in the model were based on analyses of ASPRS data.

Three different scenarios of the production of new plastic surgeons entering practice were presented in the study. The first (maintain) assumed that the number of graduates from plastic surgery residency training programs would remain constant at 220 in the future. The second (conservative reduction) assumed that the number of new entrants would decline to 176. The third (extreme reduction) assumed that the number of new entrants would decline to 132.

Residents and Fellows, Current and Projected

The number of graduates of residency programs is an important factor defining the different supply projection scenarios. Beyond this there is little discussion of residency programs.

Physician Demand/Need/Requirements, Current and Projected

The demand models used are different from those used in any of the other studies in their strong dependence on an understanding of the economic characteristics of different areas of the US, the sizes of which are consistent with the referral areas for plastic surgeons. The demand estimates are based on a series of separate models for each of 51 plastic surgery procedure groups identified in the 1992 ASPRS procedures Rendered Survey. Each model estimated the contribution of a number of factors (including population age and gender, plastic surgeon age/experience, industrial structure of the community, and the age/experience of other surgeons in the community) to explaining the demand for a plastic surgeon's services in a community. This individual demand was then aggregated to a total volume of services per plastic surgeons nationally.

The study also includes a location decision model that relates the procedure demand for a new surgeon and the characteristics of the community to estimate the probability of a plastic surgeon locating in each of the 183 BEA Economic Areas.

Interface Issues, Current and Projected

There is some discussion of competition with other physician specialties, and the demand model appears to include competitors as one of the elements.

Comments and Critique

The supply calculations follow a common format, but they used the wrong US population figures.

Estimating future demand based on the future economic status of various communities has merit. Economic status (i.e., per capita income) is a good predictor of the utilization of health care services. But applying it to a small specialty and projecting what that specialty does into the future has limitations; e.g., it is uncertain which plastic surgery procedures done today can be extrapolated into the future and what new technologies will be available to plastic surgeons. And it is unclear how many of these procedures will be done by other specialists, particularly if the technology permits others to perform these procedures safely.

The economic viability of practices in the future assumes a continuation of the current access to plastic surgeons and the current fee schedules, both of which may change under managed care.

PSYCHIATRY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Dorwart RA, Chartock LR, et al. "A National Study of Psychiatrists' Professional Activities". Am J of Psych, 149:11 (11/92) 1499-1505.	T					T			
2. Olfson, M, Pincus HA, and Dial TH. "Professional Practice Patterns of U.S. Psychiatrists". Am J Psych, 151:1 (1/94) 89-95.	T					T			
3. Scully JH. "Psychiatry Workforce and Health Care Reform". Am Psych Assn. 1994.							T	T	
4. Zarin, DA, Pincus HA, et al. "Characterizing Psychiatry With Findings From the 1996 National Survey of Psychiatric Practice". Am J Psychiatry, 155:3 (3/98) 397-404.	T					T			
5. Dial TH, Bergsten C, Haviland G, and Pincus HA. "Psychiatrists and Nonphysician Mental Health Provider Staffing Levels in HMOs". Am J of Psych, 155:3 (3/98) 405-8.						T	T		
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files									
Practitioner Surveys for Specialty	T					T			
Consensus Groups and/or Interviews									
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
AAHP Survey							T		
Resident/Program Director Surveys									

Overview of Studies

These studies traced changes in practice patterns of psychiatrists in the U.S. in 1990s. Studies #1, #2, and #4 are based on responses to the 1988-89 and 1996 National Surveys of Psychiatric Practice. Study #5 reported the results of a 1993 survey of 106 HMOs of their patterns of staffing for mental health services. Study #3 related the findings of a number of workforce studies to national health care reform initiatives adopted and discussed in the early 1990s.

The general picture of psychiatry practice that emerges from these studies is that there is considerable variety in practice arrangements of psychiatrists. Although study #3 reported that the supply of psychiatrists had increased from 13.3 per 100,000 population in 1980 to 16 per 100,000 in 1992, none of the studies provided estimates of the future supply. Concerns were also expressed about the possible impact of downsizing of GME being proposed by COGME and competition with psychology and social work, both of which are growing rapidly.

PSYCHIATRY

Physician Supply, Current and Projected

The discussion of supply was based heavily on analyses of the 1988-89 and 1996 National Surveys of Psychiatric Practice conducted by the APA. Studies #1, #2, and #4 each addressed a different set of workforce issues based on the survey responses. Study #1 showed that the percentage of women had increased since 1982, and the median age was virtually unchanged, as was the racial-ethnic mix. The number of psychiatrists per 100,000 population in 1988 varied from 4.8 in the southwest central region to 15.9 in New England. The average paid work week for psychiatrists was 48 hours, and 67% of their time was devoted to patient care. Incomes for men were significantly higher than for women.

Study #2, which also was based on the 1988 survey, focused more on work setting of psychiatrists. It reported that one-quarter worked in the public sector. Nearly one-half are primarily engaged in office practice, and three-quarters have secondary practice settings. The study reported a variety of demographic and caseload statistics for the seven practice settings.

Study #4, which was based on the 1996 survey, focused on It noted the growing proportion of women (and a 15% smaller workload for women), the decline of USMGs entering the specialty, and a small reduction in hours worked compared to the 1988 survey.

Residents and Fellows, Current and Projected

None of these studies examined psychiatry residency training programs.

Physician Demand/Need/Requirements, Current and Projected

The discussion of demand for psychiatrists in study #3 focused on the estimation of the ratio of FTE psychiatrists to members in HMOs in the U.S. Using data for 30 HMOs from the American Association of Health Plans, the study estimated the that there were 6.8 psychiatrists and 22.9 nonphysician mental health professionals per 100,000 HMO enrollees. Although the number psychiatrists per enrollee was less than the need estimated by GMENAC, it was 40% to 80% greater than that estimated by other studies of managed care staffing patterns.

Study #5 described an update to the GMENAC needs study, adjusting for the lack of recognition and coverage of mental illness in 1994. It concluded that managed care would reduce the demand for psychiatrists, although it is difficult to interpret the numerical implications. Options for adjusting the workforce were suggested.

Interface Issues, Current and Projected

Although there was a brief discussion of competition with psychology and social work in study #3, none of the studies made an effort to develop estimates of the magnitude of this phenomenon.

Comments and Critique

These studies provide a great deal of data and insights about the psychiatric workforce. However, as pointed out in Study #3, the answer to the question about how many psychiatrists are needed depends on what it is that psychiatrists will do. This is a function not only of the prevalence of psychiatric disease and the level of co-morbidity but also of the proportion who need a psychiatrist and the norms of care. Central to this are considerations of managed care and of the contributions of psychologists, clinical social workers and other therapists to the treatment of psychiatric and behavioral disorders.

RADIOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Burkhardt JH, Sunshine JH, and Shaffer KA. "The Employment Market for 1996 Diagnostic Radiology and Radiation Oncology Graduates: Training Program Directors "Point of View". Am J Radiol, 169 (8/97) 333-337.			T	T					T
2. Deitch CH, Chan WC, Sunshine JH, and Shaffer KA. "Profile of U.S. Radiologists at Mid-decade: Overview of Findings From the 1995 Survey of Radiologists". Radiol, 202 (1997) 69-77.	T					T			
3. Mallick R, Leader SG, Sunshine JH, and Shaffer KA. "Hiring by Radiology Groups in 1996". Radiol, 205 (1997) 479-486.							T		T
4. Lalman D, et al. "Initial Employment Experience of 1996 Graduates of Diagnostic Radiology and Radiation Oncology Training Programs". Am J Radiol, 171 (8/98) 301-310.						T			T
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files									
Practitioner Surveys for Specialty	T					T			
Radiology Practice Groups							T		T
AMA GME File and/or NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys	T		T	T		T			T

Overview of Studies

These studies, initiated in large part by growing concerns about an impending surplus of radiologists in the U.S., presented a variety of information about practice patterns and job markets for radiologists. Studies #1 and #4 summarized the responses of residency program directors and graduates, respectively, to questions about the job market experiences of radiology residents in 1996. Study #2 summarized the responses to a practitioner survey of a sample of 2,904 radiologists of all types requesting information about their demographic, professional, and practice characteristics. Study #3 summarized the responses to a survey of employers of radiologists about hiring activity in 1996.

Note: The Research Department of the American College of Radiology conducts annual surveys of training program directors, residency graduates and physician groups that hire radiologists and the results are published in radiology journals.

RADIOLOGY

Physician Supply, Current and Projected

Study #1 reports on current and planned annual numbers of graduates from training programs, which are major components of employment projections.

Study #2 profiled the population of radiologists in the U.S. in 1995. The survey of a sample of 3,024 ACR members, which had a 75% response rate, revealed that the respondents were: 14% women, 12% radiation oncologists, 62% diagnostic generalists, 26% diagnostic specialists, 92% were board certified in radiology. Among radiologists aged 55 or older, the percentage who were retired was unchanged from 1990.

The responses revealed a number of statistically significant differences across age groups and major activity (i.e., diagnostic generalist, diagnostic subspecialist, and radiation oncologist). The survey revealed interesting information about hours worked per week, weeks worked per year, and retirement plans, all of which are of interest to workforce planners.

Residents and Fellows, Current and Projected

The surveys of residents and residency program directors summarized in studies #1, #3, and #4 provide insights about the job market for radiologists. Contrary to anecdotes heard in the field, there were virtually no cases reported of a failure to find employment at the conclusion of training.

Physician Demand/Need/Requirements, Current and Projected

Study #3 examined the hiring activities of radiology groups in 1996. In addition to straight tabulations of the responses to the survey, this study involved more sophisticated analyses to identify characteristics of groups that were hiring versus those that were not hiring.

The survey revealed that the radiology groups were recruiting for more than 1700 radiologists in 1996, a figure upweighted from the sample to the entire population of groups. In fact, the survey revealed approximately 300 vacancies for radiologists as of 1996.

Interface Issues, Current and Projected

It was pointed out that approximately 25% of radiologic procedures are performed by non-radiologists.

Comments and Critique

These studies present interesting information about the radiology workforce. They do not attempt to extrapolate this information into supply-demand projections. In a separate publication, J. Sunshine (ACR) enumerated some of the factors that confound such predictions: uncertainties about technology, uncertainties about managed care, elasaticity of the radiologist's workload, teleradiology, self-referral vs. referral to radiologists, the potential of universal health insurance and the future contributions of female practitioners.

RADIATION ONCOLOGY

Studies Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Hussey DH, Horton JL, et al. "Manpower Needs for Radiation Oncology: A Preliminary Report of the ASTRO Human Resources Committee". Int J Rad Oncol Biol Phys, 35, 4 (1996) 809-920.	T	T	T	T			T	T	T
2. Sunshine JH. "Too Many Radiation Oncologists? An Empirical . Report". Int J Rad Oncol Biol Phys, 35, 4 (1996) 851-854		T					T	T	T
Data Sources									
AMA and/or AOA Master File	T								
Specialty Association and Board Files	T	T	T				T	T	
Practitioner Surveys for Specialty									
Employer Surveys							T		
AMA GME File and/or NRMP							T		
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys	T		T	T					T

Overview of Studies

These two studies were motivated by concerns that the employment situation for radiation oncologists (ROs) has been deteriorating in recent years, raising questions in some minds in the specialty that there might be an impending surplus of ROs. They examine manpower needs for radiation oncologists in the U.S. from a number of perspectives.

The data presented in study #1 painted a clear picture of a possible surplus of ROs in the future: significant growth of the number of ROs, continued production of more new ROs than are dying and retiring, evidence that HMOs tend to use fewer ROs than traditional fee-for-service settings, and growing reports of residents having increasing difficulty in finding jobs.

Study #2 confirmed some of these trends but concluded that "unemployment of ROs has been very low--a fraction of 1%--and, through 1995, training program directors report that essentially all graduates of training programs have found jobs. "However, there are strong indications that the situation is likely to deteriorate in the future." The study also reported that, despite anecdotes of early retirements in response to the "hassles' of managed care and Medicare payment constraints, "this has not happened."

Note: The Research Department of the American College of Radiology conducts annual surveys of training program directors, residency graduates and physician groups that hire radiation oncologists, and the results are published in radiation oncology journals.

RADIATION ONCOLOGY

Physician Supply, Current and Projected

Study #1 documented the growth of the supply of ROs between 1970 and 1995, which is much faster than the growth in the general population.

This study also reported that the number of ROs per capita was much larger in the U.S. than in any other country, as was the amount of equipment needed for the practice of RO.

Supply projections are presented in study #1 under two different scenarios of the future. The first assumes that current trends of production of new ROs, deaths and retirements will continue in the future, and the second assumes that the number of new residents will "fall by 40% starting in the year 2000", which results in a significant reduction in supply in 2005 and beyond.

Residents and Fellows, Current and Projected

Study #2 summarized the responses to surveys in 1994 and 1995 of directors of RO residency training programs about the experience in job market of their recent graduates. None of the program directors reported any unemployed graduates, despite anecdotes to the contrary. The surveys also revealed that, despite growing concerns about the job market for new ROs, the program directors on average expected that the number fo graduates in the future would remain essentially constant.

Physician Demand/Need/Requirements, Current and Projected

Long-term demand is extrapolated from the expected growth in the number of cancer patients and the effect that managed care will have on their access to care.

The results of unpublished research on the future demand for ROs were presented in study #1. Two different scenarios were presented, one assuming a continuation of current trajectories and the other assuming greater penetration of managed care, which yields a lower demand trajectory.

Interface Issues, Current and Projected

There was no discussion of interface issues in either of these studies.

Comments and Critique

These studies are approximations of supply, without consideration of gender, retirement, work effort or changes in the size of training programs. Short term demand is assessed by the hiring of ROs by groups (“anticipated demand”). Long-term demand is extrapolated from the expected growth in the number of cancer patients and the effect of managed care on their access to care. This is a qualitative or semi-quantitative approach that acknowledges that there is too much uncertainty to allow long term predictions, but overall trends can be understood. It probably is the appropriate kind of analysis for a relatively small specialty.

RHEUMATOLOGY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Mechanic R, Dobson A, Haynie B, and Hogan P. "Health Care Market Change and Future Rheumatology Workforce Requirements". Washington, DC: Lewin and Associates. 1996.	T	T	T	T	T		T	T	
Data Sources									
AMA and/or AOA Master File	T				T		T		
Specialty Association and Board Files			T						
Practitioner Surveys for Specialty									
Consensus Groups and Interviews		T		T			T	T	
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys				T				T	

Overview of Study

Starting from the perspective that the supply of rheumatologists was roughly in balance with demand in the aggregate in the base year of 1995, this study describes a set of models used to compare future supply and demand for rheumatologists under different sets of assumptions. Using a combination of published data, a consensus panel and a survey of residency program directors, the authors concluded that, despite existing forces that will lead to modest increases in supply, demand for rheumatologists will exceed supply in 2010 unless there are very large reductions in rheumatology residency training programs. The "most likely" supply and demand estimates result in a 31% oversupply of rheumatologists by 2010.

All aspects of the study drew heavily on the input from a consensus panel of 11 experts (9 rheumatologists, one insurance executive, and one orthopedic surgeon). This was combined with data from a variety of sources in order to develop models that projected the potential impact of a variety of supply and demand scenarios.

RHEUMATOLOGY

Physician Supply, Current and Projected

Based on data from the AMA Master File, the study indicated that in 1994 there were 1.1 rheumatologists per 100,000 population in the U.S. The data also showed variations of more that 6 to 1 across the 50 states, from 0.33 in Alaska to 2.02 in Massachusetts.

An age-cohort flow model was used to project the supply of rheumatologists out to 2010 and 2020. Mortality and retirement rates were estimated based on calculation on data from AMA files. Three different supply scenarios were presented: The low scenario ("extreme reduction"), which reduced residency programs by 50%, was designed to achieve supply-demand equilibrium by the year 2020. The mid scenario, which assumed a 33% reduction in residency programs based on projections of the ACR survey of program directors, resulted in relatively stable supply starting in 2010. The high scenario, which assumed an 18% reduction in new entrants based on estimates by the consensus panel, left the supply continuing to grow out to 2020.

Residents and Fellows, Current and Projected

The study incorporated several alternative assumptions about the future of rheumatology training. These assumptions reflected both new RRC requirements that full-time faculty members be increased from 2 to 3, and a variety of assumptions about how programs would respond to changes in GME funding, new physician interest in rheumatology, and changes in IMG policies. The three supply scenarios project reductions in graduating residents of 18%, 33%, and 50%. Only the largest reduction brings supply into line with projected demand.

Physician Demand/Need/Requirements, Current and Projected

Baseline demand, which equaled the then current supply, was 1.1 rheumatologists per 100,000 population, ranging from 1.27 in urban areas to 0.50 in rural areas. The study identified a number of factors that might influence demand, including population growth and aging (+13.1%), saturation in existing markets and consumer information about treatments (1.2%), competition from other providers (NA), managed care (-7.0%), and new drugs and technologies (NA). The percentage changes above, which are based on the "most likely" demand scenario developed by the consensus panel, were estimated to generate a net 6.1% increase in demand.

Interface Issues, Current and Projected

The study commented on possible competition with other physician specialists in the future, especially generalists and orthopedic surgeons. Both were expected to increase in numbers and, depending on their professional decisions about whether to compete for rheumatology patients, both could be potent competitors.

Comments and Critique

This study points reveals some of the difficulties in measuring supply and demand in a small specialty. The disparities in geographic distribution of rheumatologists are marked (6-fold among states). Rheumatologists see a minority of the rheumatologic disease. That proportion may decrease with the availability of pharmaceutical agents that can be safely administered by generalists. Conversely, as patients become better informed, they may specifically seek the expert care of rheumatologists.

THORACIC SURGERY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Cohn LH, et al. "Thoracic Surgery Workforce Report: The Fourth Report of the Thoracic Surgery Workforce Committee". J Thorac Cardiovasc Surg, 110 (1995) 570-85.	T					T			
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files	T								
Practitioner Surveys for Specialty	T					T			
Consensus Groups and Interviews									
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Study

This study summarizes the responses to a 1993 survey of all 3,487 members of the American Association of Thoracic Surgeons (AATS) and the Society of Thoracic Surgeons (STS). The report summarizes a variety of questions about demographic characteristics, practice characteristics, practice location, numbers of procedures. It was stimulated in part by growing evidence of increasing penetration of managed care into the health care system and the (then) recent report of COGME recommending major changes in residency training in the U.S.

The report provides a variety of tabulations and charts that help to understand the nature of the thoracic surgery workforce and basic practice patterns.

THORACIC SURGERY

Physician Supply, Current and Projected

The study presents a variety of simple tabulations and cross-tabulations that describe thoracic surgeons and their practice patterns in 1993. The response rate to the survey was 87%, which is a strong indicator of the validity the responses and the interest of the specialists in this discipline. The study reveals that 45% of thoracic surgeons practiced in a single-specialty group practice, 23% were in solo or group practice, and 19% were in an academic practice. Younger respondents were much more likely to be in a single-specialty group, while older respondents were more likely to be in a solo or group practice. While 65% of respondents were in fee-for-service practice, 29% were on salary.

Tabulations were presented that revealed self-designated specialties, numbers of cases of different types, and numbers of adult cardiac procedures, pediatric cardiac procedures, and general thoracic procedures by age group, type of practice, and geographic region. The frequency of peripheral vascular procedures and pacemaker procedures were also presented.

Residents and Fellows, Current and Projected

This study does not examine thoracic surgery residency programs.

Physician Demand/Need/Requirements, Current and Projected

This study does not deal with the demand for thoracic surgeons.

Interface Issues, Current and Projected

The study does not address issues related to interfaces with other specialties and professions.

Comments and Critique

This study is a practitioner survey. It was not intended as a comprehensive look at the thoracic surgery workforce.

UROLOGY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Gee WF, et al. "Subspecialization, Recruitment and Retirement Trends of American Urologists". J of Urology, 159 (2/98) 509-511.						T			
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files									
Practitioner Surveys for Specialty						T			
Consensus Groups and Interviews									
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)									
Claims Data									
Resident/Program Director Surveys									

Overview of Study

This study summarizes the responses to a 1996 telephone survey of 507 practicing urologists in the U.S. It was designed to gather information about the practice patterns in urology.

Respondents think there may be too many urologists in training. They also felt that subspecialty board certification could be a divisive issue for the specialty. Of the responding urologists, 90% have an active retirement plan, although 23% are not funding the plan fully.

UROLOGY

Physician Supply, Current and Projected

The telephone survey reveals a number of basic facts about the urology workforce in the U.S. The two most prevalent practice types were partnerships (48%) and solo practice (32%). The mean number of urologists in a group was 3. Of the urologists surveyed, 41% practiced in large urban areas, 25% in suburbs of large urban areas, 24% in smaller communities, and 9% in rural areas. During an average week the typical urologist sees nearly 76 patients, 16% treat 50 or fewer and 14% treat more than 100 patients. Urologists performed 14 minor (e.g., vasectomy, cystoscopy), 4 major endoscopic, and 3 major open procedures per week. Only 5% of urologists devote the majority of practice to urological al subspecialty.

Residents and Fellows, Current and Projected

Aside from reporting that practicing urologists feel that too many residents are being trained, this study does not include information about residency training.

Physician Demand/Need/Requirements, Current and Projected

This study does not address the question of demand for urologists or urology services.

Note: Subsequent surveys obtained information on the practice patterns of urologists in the treatment of BPH and prostate cancer and the participation of urologists in managed care.

Interface Issues, Current and Projected

This study does not mention interface issues.

Comments and Critique

This study achieved its limited stated objectives of gathering basic information about practice patterns in urology.

These data may serve as useful baselines for comparisons with similar surveys in the future.

VASCULAR SURGERY

Study Reviewed	Current and Historical Supply	Supply Projections	#s of Trainees/Programs	Projected Trainees/Programs	Geographic Distribution	Current Practice Patterns	Current Demand/Need/Req	Projected Demand/Need/Req	Current Job Availability
1. Stanley JC, et. al. "Vascular Surgery in the United States: Workforce Issues". J of Vasc Surg, 23:1 (1/96) 172-81.						T	T		
Data Sources									
AMA and/or AOA Master File									
Specialty Association and Board Files									
Practitioner Surveys for Specialty						T	T		
Consensus Groups and Interviews									
AMA GME File and NRMP									
NCHS Surveys (NHIS, NAMCS, etc.)						T	T		
Claims Data									
Resident/Program Director Surveys									

Overview of Study

This study describes two different analyses of the workload of vascular surgeons in the U.S. The first involved an analysis of responses to a 1993 survey of vascular surgeons to describe the number and types of vascular surgeries performed by vascular surgeons. The second was an analysis of data from the National Hospital Discharge Survey (NHDS) to assess trends in the numbers of vascular surgeries in the U.S. and the percentages of these surgeries performed by different kinds of surgeons.

By combining the results of the two analyses, the study estimated the percentage of a group of five "index procedures" performed by vascular surgeons and other types of surgeons. The results help to understand the marketplace for vascular surgery.

VASCULAR SURGERY

Physician Supply, Current and Projected

This study attempted to estimate the number of vascular operations performed by the vascular surgeons. The fraction of all vascular surgeries performed by vascular surgeons was estimated by dividing the vascular surgeon operations (from the SVS survey responses) by the total number of surgeries performed (from the NHDS analysis). It was assumed that nonrespondents had the same caseload as respondents. The conclusions were that vascular surgeons performed between 64% and 97% of the five "index procedures" identified as central to vascular surgery practice.

Residents and Fellows, Current and Projected

This study does not examine residency training for vascular surgery, except to document the year of completion of training of respondents to the SVS survey.

Physician Demand/Need/Requirements, Current and Projected

The study examined estimates of the numbers and percentages of the population that will be 55 and older and 65 and older in the future. This aging of the population is likely to increase the demand for vascular surgery in the future.

Interface Issues, Current and Projected

A key element of this study is an understanding the roles of different surgical specialties in performing vascular surgeries.

Comments and Critique

This study focused on assessing trends rather than carrying out mathematical analyses and projections. Starting from where things are today, it assessed:

(1) trends in the use of various vacular surgery procedures
(2) trends in who is performing these procedures
(3) trends in the impact of aging baby boomers on the future demand for vascular procedures.

This study provides useful information for workforce planning in a small surgical specialty with a scope of practice that is also encompassed by other surgical disciplines

APPENDIX D
Conceptual Framework

Richard Cooper, M.D., Director of the Health Policy Institute at the Medical College of Wisconsin, has developed a "trend model" as an alternative to the "quantitative models" discussed in this paper. It utilizes the principles of **measuring** those elements that readily can be counted, **estimating** those that reasonably can be approximated, and, like socio-demographic models, **assessing trends** among the external factors that affect health care providers. Future demand for physicians is derived through a process that extrapolates major trends, recognizing that there is uncertainty associated with each trend and that there is a complex and often interdependent interplay among them.

While Dr. Cooper's trend model is not being endorsed by COGME, it is included in this report as an example of one approach to workforce analysis. As this and other models evolve, researchers will have an opportunity to discuss and challenge their merits. As changes continue to sweep through our health care system, future studies will require new conceptual frameworks to guide the study of the specialty physician workforce.

The schematic below depicts the trend model. Each component of the model is discussed in the following text. The model is currently being refined by Dr. Cooper.

SUPPLY

The starting point is an estimate of the physician labor force, including all physicians (other than those who are retired) irrespective of their work effort, mix of professional responsibilities, or productivity. This estimate recognizes that the supply and distribution of physicians does not follow simple time-demand relationships; rather, it also is influenced by inter-professional and personal considerations. Therefore, physician supply is expressed as a head count rather than a derived number of FTE physicians. Measures of physician supply are obtained from sources such as the AMA Master File, specialty society records, re-certification data, etc., and differences among these data are reconciled in order to make final estimates.

SUFFICIENCY

The level of supply that is measured and estimated in this manner cannot be taken as a normative value from which future supply is projected. Rather, this level must be interpreted in the context of the utilization patterns of physicians (job opportunities, desire for additional workload, etc.) and the adequacy of the services being provided (waiting times, unmet needs, excessive services, etc.). Information of this nature can be derived from sources such as patient surveys (e.g., National Health Interview Survey), surveys and consensus panels of physicians, and surveys of group practices and other organizations that employ physicians.

* *Supply* × *Sufficiency* defines **"the current state of affairs."** It is the baseline from which future trends are considered.

MAJOR ECONOMIC TRENDS

The dominant factor in the growth of the demand for physicians from the "current state" to a "future state" is the overall growth of the economy, as measured by indices such as the gross domestic product (GDP), personal consumption, disposable income, etc. These broad indicators must be reduced to the portion of economic growth that is devoted to the health care sector.

SECTOR TRENDS

The "future state" also is influenced by trends in eight general sectors. Four of these sector trends impact principally on supply and four on demand. However, these trends are not independent of each other, and they are all dependent, at least to some degree, on the underlying "major economic trends." Moreover, these trends must be considered within the context of the time frame of the extrapolations being

Dr. Richard Cooper's Trend Model

made. Near-term projections (3-5 years) can depend on trends that are already apparent, whereas projections that are within the time frame of importance to training decisions (10-15 years) strain the margins of the predictability and must be revisited at frequent intervals.

SUPPLY TRENDS

* **Attrition** considers the separate trends in death rates, retirement age, and separation from practice, as well as the redirection of professional effort among various clinical and non-clinical roles.
* **Productivity** considers the interrelated trends in both professional time and work output. Among the factors influencing time and output are gender, age, life-style, employment status, and efficiency.
* **Substitution** considers the trends in the specialty contributions of both out-of-specialty physicians and non-physician clinicians, as well as the contributions of specialists to out-of-specialty care.
* **Geographic distribution** recognizes the regional differences in racial and ethnic mix, economic potential, and health care preferences. It considers the trends toward decreasing or increasing the disparities that exist in both the density of physicians and the volume of services utilized.

DEMAND TRENDS

* **Technology** considers trends in areas such as pharmaceutical, medical equipment, and information technology. It considers the impact they will have on the type and volume of services that will be utilized and on the distribution of responsibility among various professionals in providing those services.
* **Demographics** considers the rate of growth of the population overall and of particular age and ethnic groups, as well as trends in the service needs of these various segments of the population.
* **Health systems** trends address changes in coverage, access, markets, reimbursement policies, and consumer preferences. They consider the likely effects of these changes on the type and volume of services that will be purchased and on the clinical and non-clinical roles that physicians will be called upon to serve.
* **Economic dependency** considers the sensitivity of particular specialty services to the broad underlying economic trends that affect health care services.
* *Supply* × *Sufficiency* × *Economy* × *Trends* defines **"the future state of affairs."** It projects the supply of physicians that will be **demanded** for the evolving health care system.

GOVERNORS

In projecting "the future state of affairs," it is assumed that this future will result from the natural evolution of the current fiscal and organizational characteristics of the health care system and the societal fabric in which it exists. These characteristics currently include an emphasis on technology and specialization, a responsiveness to consumer demand, and an expanding portion of the gross domestic product devoted to health care spending. While some have championed all of these characteristics as desirable, others have recommended a reversal of the current trends by slowing technology, increasing the emphasis on primary care, curtailing consumer demand, and redirecting national spending to other priorities. In defining "the future state of affairs," the trend model is nonjudgmental about these and other issues. Yet they are important, and cross currents of opinion exist about each of them. The "governors" module provides an opportunity to modify the basic projections of "the future state of affairs by introducing value judgments concerning these and other issues and, thereby, allowing the projection of a "desired state of affairs." However, by deferring such judgments to this separate module, it frees the basic analysis from bias and permits a subsequent juxtaposition of deterministic and philosophic formulations of the future needs for physicians in an accessible and objective manner.

- *Supply* × *Sufficiency* × *Economy* × *Trends* × *Governors* defines **"the alternative state of affairs."** This projects the supply of physicians that will be **desired** for a preferred health care system.

FUTURE

The number of specialists that will be **needed** or **desired** in the future is derived from the composite of these various data inputs, trends, and governors. This number is expressed relative to the number of specialists who are engaged professionally today. As is true for current supply, this number is expressed in terms of all active specialists, irrespective of their degree of activity or the roles that they fill, and it is expressed as a range that encompasses the uncertainties associated with the underlying data, assumptions, and trends. It is this number that forms the basis for decisions concerning the numbers of students and residents who must be trained to satisfy that future need.

APPENDIX E

Participants – CMSS Specialty Workforce Advisory Committee

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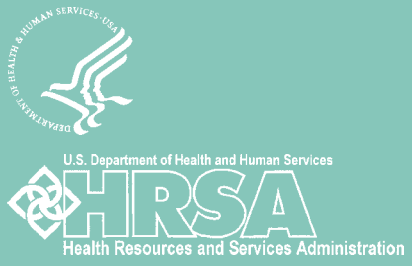
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